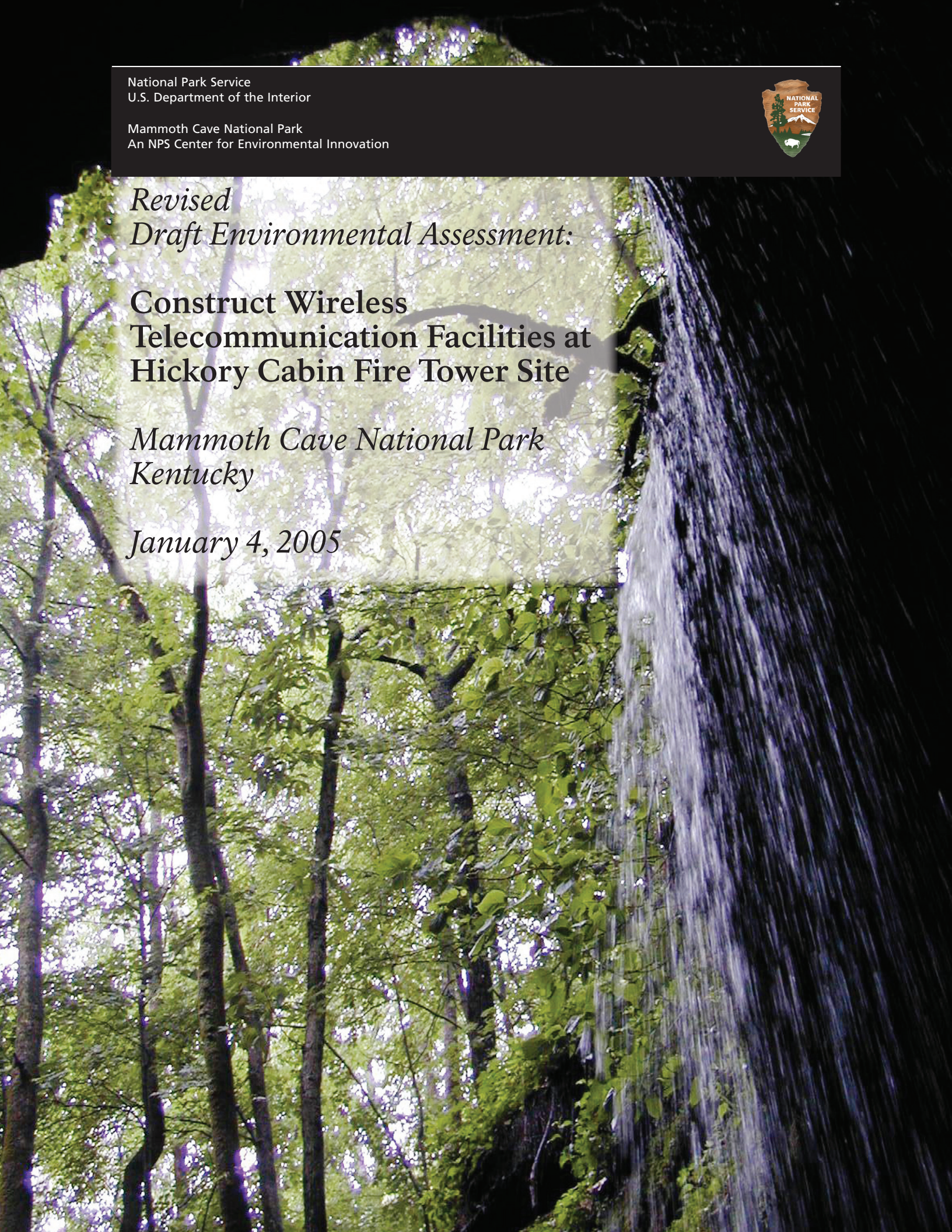

National Park Service
U.S. Department of the Interior

Mammoth Cave National Park
An NPS Center for Environmental Innovation

Revised
Draft Environmental Assessment:

Construct Wireless Telecommunication Facilities at Hickory Cabin Fire Tower Site

Mammoth Cave National Park
Kentucky

January 4, 2005

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Mammoth Cave National Park, Kentucky

PROJECT HISTORY

A draft environmental assessment was published for public review in June 2004 for a period of thirty days ending on July 15, 2004. One letter was received from the Board of Directors of the Karst Environmental Education and Protection, Inc. (KEEP). KEEP raised a number of issues. Their letter is included in the attachments. KEEP stated their belief that the draft environmental assessment had several flaws. Specifically KEEP submitted the following:

> "The purpose and need statement is not factually and numerically justified;
> The no-action alternative is dismissed without analysis;
> The impacts analysis for viewshed impacts is not technically presented or supported in the draft EA and possible beneficial impacts to the Park are not presented; and
> The proposed mitigation measures for the NPS's preferred alternative are incomplete."

In response to the comments submitted by KEEP, the park has included additional information about the nature and frequency of incidents to better describe the health, safety, and security benefits that would be derived from improved cellular phone coverage. The no-action alternative is now included in the analysis and incorporates a location north of the park that could result if the park decides against a tower location in the park. A viewshed analysis has been completed as suggested by KEEP, and a balloon test was also completed. The possible beneficial impacts to the park are presented especially as relates to co-location of park radio equipment. The park has agreed to include all but one of the additional mitigation measures proposed by KEEP.

During the time it has taken to complete the viewshed analysis requested by KEEP, the park has continued to receive written comments and telephone inquiries about the proposal. All the additional written comments received have also been attached. One individual commented by phone, and requested that information be included in the revised document concerning the potential for other cellular tower locations in the park and the extent to which this decision might set a precedent for decisions concerning proposals for towers at additional locations at Mammoth Cave National Park and at other National Parks.

The environmental assessment has been revised and updated to include the results of viewshed analysis, informal consultation with the U.S. Fish and Wildlife Service (USFWS), and consultation with the Kentucky State Historic Preservation Officer (SHPO) under the programmatic agreement between the park, the SHPO, and the Advisory Council on Historic Preservation. USFWS concurred that the proposed project will not likely adversely affect listed or candidate species known to be present at Mammoth Cave National Park. The SHPO found that no potential exists for adverse impacts to historic properties as a result of this undertaking. These items were completed after the previous public review period, and copies are included in the

attachments to this document. This revised draft environmental assessment will be sent to the SHPO and to USFWS for additional review.

In July 2004, a site assessment of the park radio system was completed by Motorola. The assessment indicated the need for additional towers and repeaters for the park radio system. The park completed its initial conversion to a digital narrowband system in November 2004. The analog radio coverage was inadequate, and coverage by the digital system is reduced in the fringe areas. Motorola recommended that the park place a second repeater at the Hickory Cabin site, a third repeater on the former AT&T site near Brownsville (outside the park), and possibly a fourth repeater somewhere along the northeast boundary of the park. The fourth tower would be relatively short because it would serve a specific area along Green River including Cub Run Hollow, and portions of Wilson Cave Hollow. In November 2004, the park completed an agreement with the Edmonson County Fiscal Court to locate a repeater at the tower site near Brownsville. Installation of National Park Service radio equipment at the Brownsville tower site should be completed in 2005. In regard to the proposed tower location at the Hickory Cabin Fire Tower site, Motorola engineers specifically stated that a tower on the ridge approximately 2 miles north of the Hickory Cabin site, an alternative suggested by KEEP, would not provide the needed coverage along the Green River and in several of the deep hollows north of the Green River. Consequently, the National Park Service would construct a tower in the future at the Hickory Cabin site if Bluegrass Cellular or some other provider does not. The National Park Service then would bear the full cost of construction, operation, and maintenance for the tower, which would then be available for co-location.

Under the current proposal Bluegrass Cellular would bear all cost of construction, operation, and maintenance of the tower and their facilities, would allow co-location of park radio equipment and provide power to that equipment without charge to the park, and, in addition would pay the park an annual fee for use and occupancy of the land that would be in the range of $3,000 to $6,000 per year. The exact amount of the fee will be negotiated with Bluegrass Cellular after they submit their official application. Bluegrass Cellular will reserve space on the proposed tower for Mammoth Cave National Park radio equipment. The park has received an inquiry from a Sprint representative concerning co-location, and in response has provided information on the requirements for co-location. Any company co-locating on the proposed tower would be subject to all the same requirements as this proposal, and would be required to pay the annual fee for use and occupancy in addition to any financial arrangement with Bluegrass Cellular.

In response to questions about other tower locations in the park and the potential for this decision to set a precedent, it is certain that a single tower at the Hickory Cabin Fire Tower site would be sufficient to provide a reasonable level of coverage in the central areas of the park. Adequate coverage in other areas of the park can be achieved by facilities located outside the park boundary. National Park Service policy requires that these facilities not be constructed in wilderness study areas. The majority of the park is part of previously established wilderness study areas. The Hickory Cabin Fire Tower site is the only location in the park that would provide the coverage needed in the central area of the park with a single tower less than 200 feet in height. The existing radio tower in the Operations Area would provide potential for co-location. For these reasons and because utility connections are not reasonable available in other locations, the

park does not intend to consider any tower locations in the park in addition to the Operations Area site and the Hickory Cabin Fire Tower site. Expansion of the existing sites to accommodate additional towers also would not be considered.

There is potential in the developed Headquarters Area for future installation of a wireless network which could provide wireless telephone communications in addition to wireless Internet access. Installation of a wireless network would not require construction of a tower or other highly visible infrastructure. There is a strong possibility that a wireless network will be installed to serve the Mammoth Cave Hotel and the area immediately around the Visitor Center in the next several years.

Satellite telephone and radio services are already available in the park, and some people make use of these services. The use of Global Positioning System equipment by park visitors is increasing. There is adequate reason to believe that use of satellite based systems will increase in the future.

This revised draft environmental assessment will be available for public review and comment for a period of thirty days. Following that review period, comments will be analyzed, and a decision will be made.

PURPOSE AND NEED

This Environmental Assessment (EA) provides decision-makers and the public with information and analysis on alternatives related to the proposed placement of wireless telecommunication facilities within Mammoth Cave National Park. This EA is being prepared based on preliminary meetings with Bluegrass Cellular. An application for the placement of wireless telecommunications facilities within the park is expected to be received from Bluegrass Cellular in early 2005 for construction of facilities in 2005.

The National Park Service (NPS) is required by Section 704 (c) of the Telecommunications Act of 1996 (47 U.S.C. 332) to develop "procedures by which Federal departments and agencies may make available Federal properties, rights-of-way, and easements for wireless telecommunication services." The NPS is also required to comply with the provisions of the National Park Organic Act of 1916, the National Environmental Policy Act of 1969 (NEPA), the National Historic Preservation Act of 1966 (NHPA), the Archeological Resources Protection Act of 1979 (ARPA), the National Park Service Director's Order (DO) 12, and Reference Manual (RM)-53 Special Park Uses.

The wireless telephone signal strength within the park is not sufficient to provide reliable wireless telephone communication coverage. The use of cellular telephones by the public, park staff, researchers, concessions, and contractors working within the park is increasing. Cellular telephone users would benefit from improved telecommunication services for their safety and security, personal, and business needs. The public should have increased capability to call for help using their wireless mobile telephones and in the near future enhanced 911 services should provide additional safety by locating wireless telephone users who are lost or injured. The primary purpose of the proposal is to provide improved telecommunications to enhance the

health, safety, and security of park visitors and employees as well as those people who commute through the park or live and commute in the area immediately north of the park.

The health, safety, and security needs are indicated by specific incidents in recent years. In 2002, there were 35 Emergency Medical Service (EMS) incidents in the park involving 47 victims and an additional 16 Search and Rescue (SAR) incidents involving 22 victims. In 2003, there were 13 EMS incidents involving 17 victims and an additional 7 SAR incidents involving 14 victims. On June 8, 2002, a camper became unconscious at a backcountry campsite. The camper's only companion had to hike out to call for help. The patient was left alone for several hours. On November 15, 2002, a horseback rider suffered a possible heart attack. Another rider had to go for help. It took several hours to locate, treat, and stabilize the patient. In August 2004, a Park Ranger came upon a two fatality motor vehicle accident on the Houchins Ferry Road and had to leave a third victim who was critically injured lying in the road to drive to the top of the hill to call for assistance. Even though many people would realize other benefits from the proposed cellular telephone tower, the primary need for effective communications for both park users and the park staff is health, safety, and security not mere convenience.

The affected population, which includes park visitors and other recreational travelers in the region, nearby residents, and non-recreational visitors and traffic in the park and surrounding area, is substantially more than 2,000,000 people annually. Recreation visits to the park are estimated to average about 2,000,000 each year based on data from traffic counters and trail registers. Reliable estimates are not available for the number of people who travel through the area north of the park that would be served by the proposed tower. On any given day even during peak park visitation and visitation to Nolin Lake, the number of people who would be affected is estimated to be at least 30,000.

This Environmental Assessment is intended to facilitate compliance with the National Environmental Policy Act and various other related administrative and legislative requirements.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action would result in issuance of a right-of-way permit and construction and operation of wireless telecommunications facilities including a tower (185 feet tall), transmission, and support facilities surrounded by a security fence at the Hickory Cabin Fire Tower site. The maximum height of the tower and any attachments is 185 feet above ground level. Buried electric and telephone utilities would be extended for a distance of approximately 600 feet along and within the existing access road corridor to the fire tower site. Antennas and coaxial lines would be placed on the tower for communications purposes. It is anticipated that nine directional panel antennas would be placed on the tower. The antennas would be arranged in a triangular fashion with three antennas oriented in each of three directions (sectors), each spaced 120 degrees apart. The tower, because it is less than 200 feet in height, would not be required to be painted orange and white. The proposal is to allow the metal to weather to a mottled non-reflective surface that would blend in with the surrounding vegetation. Associated equipment would be housed in a prefabricated building located at the base of the tower. The building would be about 12 feet wide and 20 feet long. The Facilities would require electrical service and

telephone land lines. A backup propane powered generator would also be placed at the base of the tower. The installation would be surrounded by a wooden fence that would weather to a natural gray surface within a few months which would serve to conceal the ground level facilities from view. The area within the fence would be about 65 feet square and would be surfaced with gravel. Site access would use the existing gravel road. Utilities would be buried within the existing access road corridor. An aircraft warning light would not be required because the proposed height of the tower is less than 200 feet above ground level. Co-location of equipment owned by other wireless telecommunication providers and National Park Service radio facilities is included in the proposal. An inquiry about co-location has been received from a representation of Sprint.

Any permit issued would provide for co-location of equipment owned by other wireless telecommunication providers and NPS radio facilities. The permit would include clauses that require the mitigating actions specified in this environmental assessment (see page 49). Additional providers who propose to co-locate their facilities at this site would be required to execute an appropriate agreement with Bluegrass Cellular, in addition to acquiring a right-of-way permit from the National Park Service, and to bear all the costs associated with processing their permit application, including environmental and other analysis, and installation and maintenance of their equipment, and any necessary upgrade of utilities.

PERMITS, LICENSES, ENTITLEMENTS, AND REVIEWS NECESSARY TO IMPLEMENT THE PROJECT

The Telecommunications Act of 1996 addresses some of the technical problems that have arisen from the increasing popularity and use of mobile communications. President Clinton's memorandum of August 10, 1995, titled "Facilitating Access to Federal Property for the Siting of Mobile Services" directs federal agencies to develop procedures necessary to facilitate access to federal property for the siting of mobile service antennas. Section 704 (c) of the Telecommunications Act of 1996 and the regulations promulgated pursuant to the Act make federal property, including parklands available for placement of telecommunications equipment by duly authorized providers absent unavoidable conflicts with the department or agency mission, or the current or planned use of the property, or access to that property. The specific NPS guidance and procedures are contained in Director's Order 53: Special Park Uses and the accompanying reference manual, RM-53. The National Park Service general authority to issue right-of-way permits for power and communications facilities is in 16 U.S.C. Section 5 with regulations in Title 36 CFR Part 14.

Other permitting or review actions will be required before proceeding with the proposal. The following is a list of the requirements with a brief description of the purpose of each requirement.

- NPS Right-of-Way permit, which would be issued if no significant impacts are identified during the Environmental Assessment process.

- An archeological assessment of the proposed site would be completed in compliance with the Secretary of the Interior's Standards for Archeology and Historic Preservation.
- A Construction Stormwater Discharge Permit would be obtained from the Kentucky Division of Water if the area of disturbance is one acre or greater.
- All local and state construction permits
- Federal Communications Commission (FCC) license is required for building and operating a wireless telecommunication facility.
- National Historic Preservation Act (NHPA) Section 106 consultation for any properties outside the park as specified in 36 CFR 800, and, for properties inside the park, as specified in the comprehensive Programmatic Agreement between Mammoth Cave National Park and the Kentucky State Historic Preservation Officer, and the Advisory Council.
- Endangered Species Act (ESA) Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) to assess if there is any impact to any species protected by the ESA.
- Communication with the USFWS, under the requirements of Executive Order No. 13186 Responsibilities of Federal Agencies to Protect Migratory Birds to determine potential impact on migratory birds.
- Review of application and propagation data by National Park Service Field Operations technical Service Center (FOTSC) section.
- All National Environmental Policy Act (NEPA) requirements

DECISIONS TO BE MADE

- Whether to issue a permit for construction of wireless telecommunication facilities at one of the alternative sites in the park.

The potential effects of the alternatives considered were evaluated using the impact topics listed below. Impact topics included in the analysis are: viewshed, wetlands and floodplains, vegetation, threatened and endangered species, air quality, soils/geology, water quality and hydrology, fish and wildlife (other than threatened and endangered species), migratory birds, cultural resources, visitor use, land use, transportation, social and economic, public health, public safety, Indian Trust resources, risk of unanticipated consequences, other benefits to the National Park Service, and cumulative impacts. Impact topics that are not relevant were not included, e.g., unique or important fish or fish habitat, urban quality, geohazards.

BACKGROUND

The mission and purpose of Mammoth Cave National Park was established by specific enabling legislation.[1] The mission includes the text of the legislative acts as well as related reports and

[1] 16 U.S.C. 404-404f.

speeches that were prepared in support of the legislation. Following is a selection of excerpts from the legislative record that specifically relate to resource values.

> *Your commission has also made a careful examination of the Mammoth Cave region of Kentucky and believes sufficient reasons exist to warrant its acceptance as a national park if requirements are met as outlined in this report. Below are briefly outlined some of these reasons. Mammoth Cave is the best known and probably the largest of a remarkable group of limestone caverns, 20 or more of which have been opened up and explored to a greater or less extent. There is good evidence that many more caverns yet to be discovered exist in this immediate territory, and it seems likely that most, if not all, of this entire group of caverns eventually would be found to be connected by passageways forming a great underground labyrinth of remarkable geological and recreational interest, perhaps unparalleled elsewhere. The Mammoth Cave area is situated in one of the most rugged portions of the great Mississippi Valley and contains areas of apparently original forests, which, though comparatively small in extent, are of prime value from an ecological and scientific standpoint and should be preserved for all time in their virgin state for study and enjoyment. Much of the proposed area is now clothed in forest, through which flows the beautiful and navigable Green River and its branch, the Nolin River. All this offers exceptional opportunity for developing a great national recreation park of outstanding service in the very heart of our Nation's densest population and at a time when the need is increasingly urgent and most inadequately provided for.*[2]

The connection between the report of the Southern Appalachian National Park Commission, the purpose of the proposed park, and the legislation that established Mammoth Cave National Park is clear in the speech by Congressman Thatcher, when he said,

> *The bill now under consideration (H.R. 12020) is drafted in strict accordance with the recommendations of the aforesaid commission.*[3]
>
> *The area called for in the bill would insure a great recreational ground, most advantageously located, where, in spring, summer, and fall thousands of our people may find—in addition to the pleasure and interest derived from an inspection of the caves and their many features of interest—the most delightful outdoor recreation in boating and fishing on Green and Nolin Rivers, lovely, navigable streams flowing for miles through the proposed park, and in traversing the picturesque and rugged hills and valleys and great forests of the region included in the proposed park area.*[4]

MISSION STATEMENTS

The following mission statements were created as broad statements of the mission requirements established by Congress in the Acts that created the National Park Service and Mammoth Cave National Park.

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[2] United States Department of the Interior, Final Report of the Southern Appalachian National park Commission to the Secretary of the Interior, June 30, 1931 (GPO: Washington D.C., 1931) 18.
[3] Mammoth Cave National Park, Speech of Hon. Maurice H. Thatcher in the House of Representatives, March 5, 1930 (GPO: Washington, D.C., 1930) 8.
[4] Speech of Hon. Maurice H. Thatcher, 11. The same language appears in the Senate, Committee on Public Lands and Surveys, Report No. 823, May 10, 1926, and the House of Representatives, Committee on the Public Lands, Report No. 1178, May 12, 1926.

National Park Service Mission

> The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration, of this and future generations. The Service cooperates with partners to extend the benefits of natural and cultural resources conservation and outdoor recreation throughout this country and the world.[5]

Mammoth Cave National Park Mission

> The mission of Mammoth Cave National Park is to protect and preserve for the future the extensive limestone caverns and associated karst topography, scenic riverways, original forests, and other biological resources, evidence of past and contemporary lifeways; to provide for public education and enrichment through scientific study; and to provide for development and sustainable use of recreation resources and opportunities.[6]

MANAGEMENT OBJECTIVES IN THE GENERAL MANAGEMENT PLAN RELATED TO THIS PROJECT

> To minimize impacts on fragile natural resources by locating facilities in areas that are able to support such use without sustaining unacceptable environmental damage.

WILDERNESS STUDY AREAS

Approximately 39,200 acres of the park were designated as study areas during a wilderness study conducted in the early 1970s. Although none of the lands within the park were found suitable for wilderness designation, in the indefinite future some of the study areas may become suitable.[7] RM-53, Appendix 5, Exhibit 6, Page A5-45 contains the following requirements:

> "Except as specifically provided by law or policy, there will be no permanent road, structure or installation within any study, proposed, or designated wilderness area (see Wilderness Act, 16 U.S.C. § 1131). The NPS will not issue any new right-of-way permits or widen or lengthen any existing rights-of-way in designated or proposed wilderness areas. This includes the installation of utilities."

There is no proposed or designated wilderness within Mammoth Cave National Park. There are study areas with potential for wilderness designation in the future. The alternative sites considered in this EA are outside the designated study areas. A copy of the map from the 1970's Wilderness Study and Recommendation is attached in Attachment 2.

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[5] United States Department of the Interior, National Park Service, GPRA on the GO: Government Performance and Results Act (GPRA) & Performance Management, Version 2.2, May 1998.

[6] Mammoth Cave National Park, Strategic Plan, 3.

[7] See Wilderness Recommendation: Mammoth Cave National Park, Kentucky. United States Department of the Interior, National Park Service. August 1974, page 1, which contains the following recommendation:

> "None of the lands in Mammoth Cave National Park are suitable at this time for wilderness designation and inclusion in the National Wilderness Preservation System because most of the area has been developed in the past and the imprint of man's work is still substantially noticeable."

ALTERNATIVES

ALTERNATIVES CONSIDERED

Alternative A: No Action
Alternative B: Construct WTF at Hickory Cabin Fire Tower Site
Alternative C: Construct WTF at Park Operations Area Site

DESCRIPTION OF ALTERNATIVES

The alternative locations that can be considered are limited to those areas not included in the designated wilderness study areas. National Park Service policy forbids issuance of right-of-way permits in any wilderness study area (see RM-53, Appendix 5, Exhibit 6, Page A5-45). A similar level of construction would be involved at any of the sites included in this analysis.

ALTERNATIVE A: NO ACTION

The no action alternative would preclude construction of wireless telecommunications facilities inside the park. This alternative would rely on wireless telecommunications providers to build facilities around the perimeter of the park. The telecommunication towers currently located around the park to the west, south, and east do not provide adequate signal strength in the park (see the service map on page 13). Locations generally north of the park would provide service improvement in the northern areas of the park, but would offer limited improvements in the central area of the park. Any tower outside the park would be highly visible from roads approaching the park, and could affect historic properties. This alternative includes the potential construction of a tower by a wireless telecommunications provider and co-location of National Park Service radio equipment on that tower, as well as the potential for the National Park Service to lease space to construct its own radio tower. There is no specific location on this ridge that is under consideration at this time. Wireless telecommunications providers would negotiate rental fees with the private landowners to site towers at a specific location of their choosing. Telephone and electric utilities are available along Highway 1827. Telecommunication service providers may, independent of this proposal, construct additional facilities outside the park in the future.

Locations outside the park would not offer the same opportunities for co-location of the park radio system. Motorola conducted a site survey to assist the park in preparing for conversion to a digital narrowband radio system as required by law and to aid the park in planning future improvements in its radio system. Radio coverage in the park is poor with the existing system, and conversion to digital narrowband has reduced the coverage, especially in areas where signal strength was marginal. The Motorola report (July 2004) indicates the need to use the Hickory Cabin site for the park radio system. The potential ridge top location discussed as part of the no action alternative is approximately two miles north of the Hickory Cabin site. Motorola engineers did not conduct an assessment of this location, but these experts did state conclusively that moving the tower from the Hickory Cabin site approximately two miles to the north would produce gaps in radio coverage particularly in the deeper hollows and the Green River Valley. It

is true that any tower on the ridge top north of the park would have a line of sight connection to the existing park radio tower; however, that relates to the ability to link the towers into a multi-cast system not to actual radio coverage. Signal strength is affected by distance, vegetation, and terrain.

National Park Service policy requires negotiation with communications users to establish a payment that is at least the amount shown on the "Rental Fee Schedule for Communications Uses" found in Chapter 90 – communications Site Management of the U.S. Forest Service Special Uses Handbook – FSH 2709.11. Based on a population in the 25,000 to 49,999 range, the minimum annual charge per year for the proposed facility would be $3,013. Bluegrass Cellular has stated they currently pay $300 to $500 per month ($3,600 to $6,000 per year) for their tower locations. The going rate for co-location on a tower is $1,500 per month ($18,000 per year). Co-location of park radio equipment on a tower outside the park would cost significantly more than a location inside the park.

Because locations outside the park would not provide the needed improvement in communications within the park to provide for public safety and security this alternative was rejected.

ALTERNATIVE B: CONSTRUCT WTF AT HICKORY CABIN FIRE TOWER SITE

Alternative B would construct and operate wireless telecommunications facilities at the site of the former Hickory Cabin Fire Tower. This site is one of the few suitable locations for wireless telecommunications facilities in the park. The Hickory Cabin Fire Tower site is previously disturbed. The fire tower, which was constructed in the 1930s, was removed in late 1980s. The area has been used as a maintenance storage area to stockpile gravel and other materials since the 1930s. There is road access to the site and telephone and electric utilities are available nearby in the Green River Ferry Road corridor. This site would provide service to the primary visitor use areas on the Mammoth Cave Ridge including the Visitor Center and Mammoth Cave Hotel as well as most of the backcountry trail system in the northwest quadrant of the park. The existing cleared area at the Hickory Cabin Fire Tower site will accommodate the footprint of the facility (65 feet square) without additional clearing. The portable building will be approximately 12 feet wide and 20 feet long. The elevation at this site is approximately 860 feet above sea level. The top of a tower 185 feet tall would be at 1,045 feet in elevation. The underlying rock at this site is Caseyville sandstone conglomerate. Beneath the conglomerate are Glen Dean and Hardinsburg sandstone followed by layers of the Haney Limestone, Big Clifty Sandstone, Girkin Limestone, and St. Genevieve Limestone.

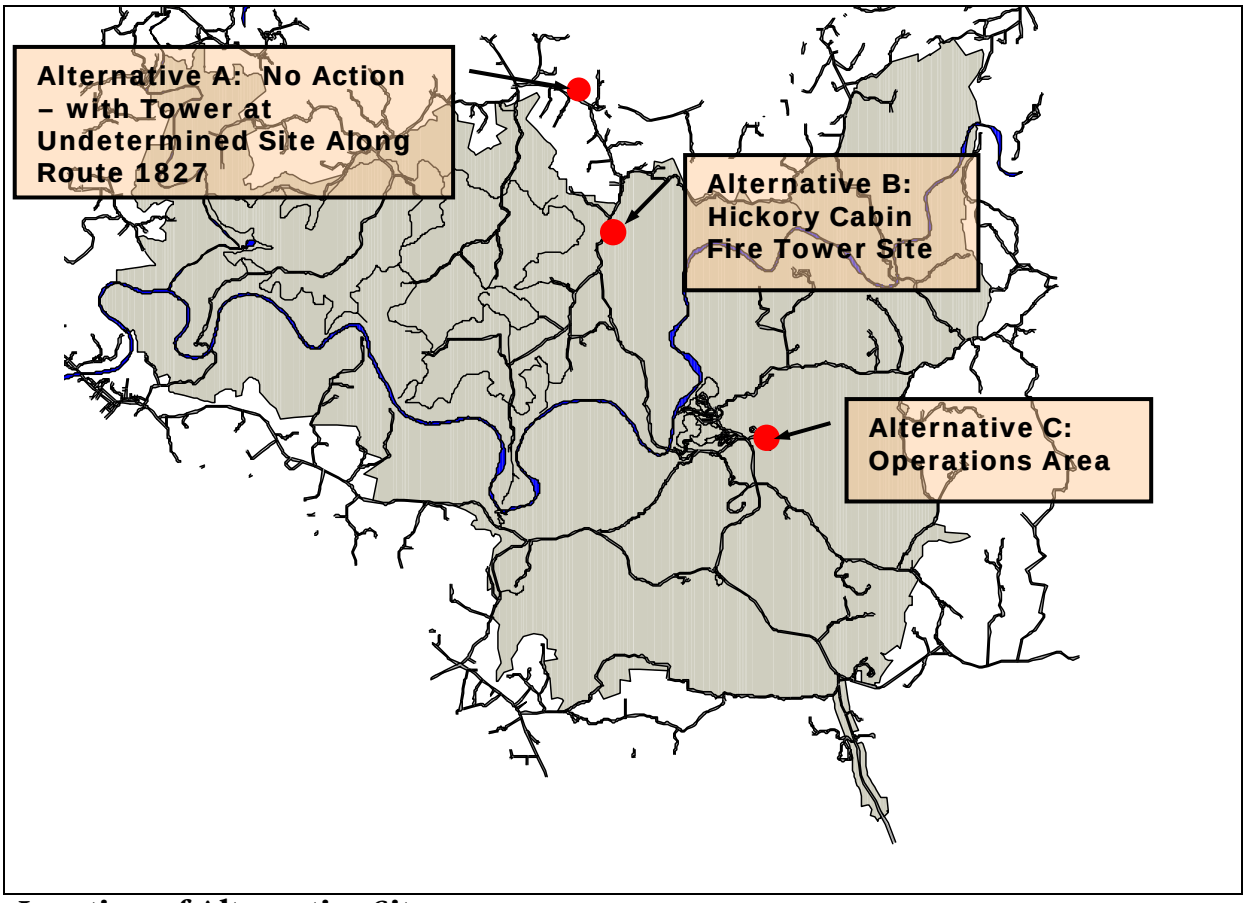
Hickory Cabin Fire Tower Site

Existing Gravel Access Road to Hickory Cabin Fire Tower Site

ALTERNATIVE C: CONSTRUCT WTF IN PARK OPERATIONS AREA

Alternative C would construct and operate wireless telecommunication facilities at the park Operations Area. Facilities would be co-located with existing park radio tower and repeater. Ground level at the Operations Area is about 760 feet above sea level. Placement of the antenna on the existing tower could not be much above 120 feet above ground level or in the range of 880 to 900 feet above sea level. This alternative would provide adequate signal strength for the major visitor facilities in the Headquarters Area, but would provide very little improvement in the rest of the park, particularly on backcountry trails north of the Green River. A tower in the Operations Area that would reach the same elevation as the Hickory Cabin Fire Tower site would have to be 280 feet tall. A tower of this magnitude would require aircraft warning lighting and would be visible to visitors in the Headquarters area and from other vantage points south of the Green River.

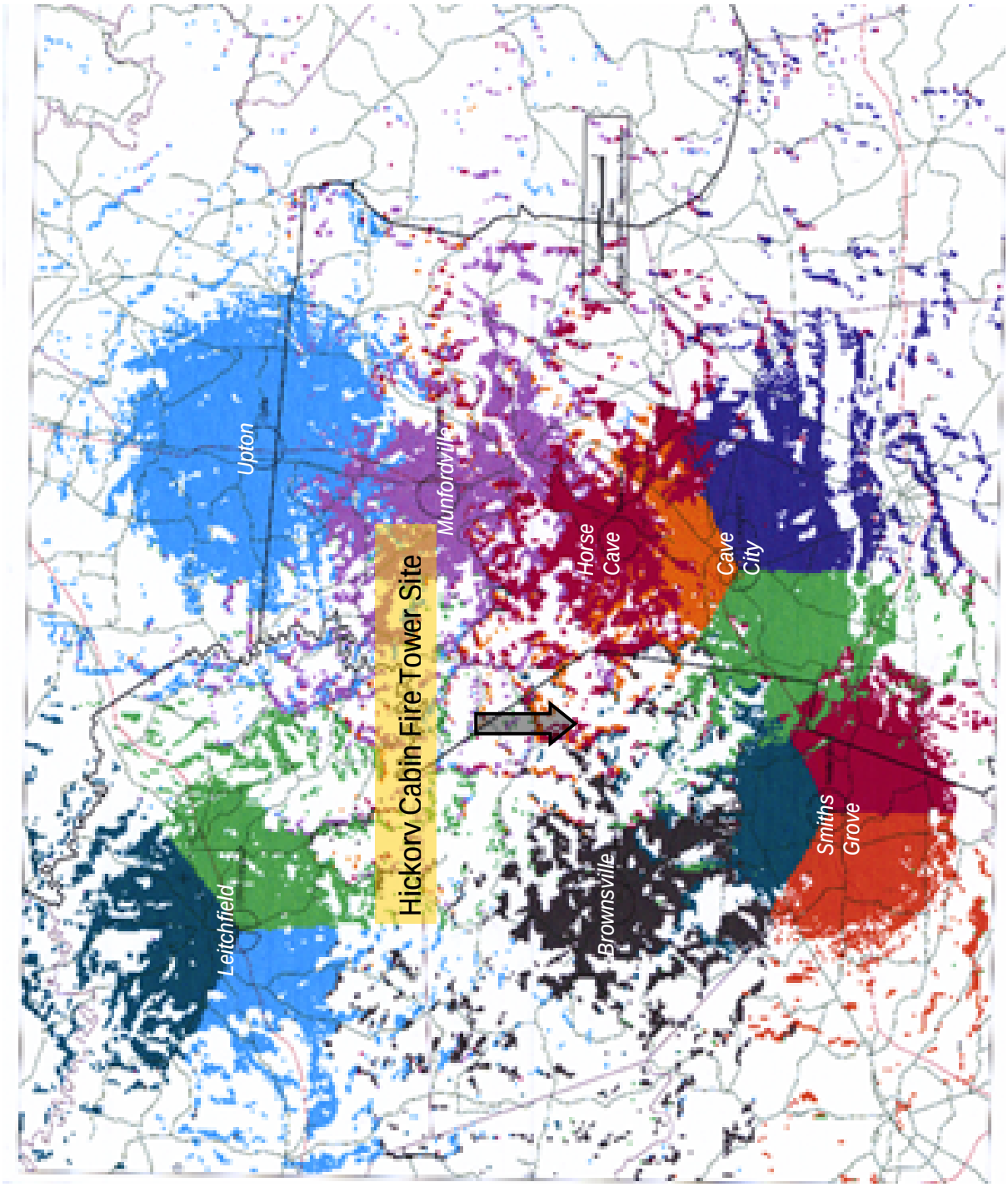
The Motorola site survey completed in July 2004 looked at whether a tower at the Hickory Cabin Fire Tower site could eliminate the need for the existing tower at the Operations Area site. The conclusion was that the Operations Area tower should be retained. Multiple repeaters linked together in a multi-cast system with a repeater and tower at three and possibly four locations, ie., the Operations Area, the Hickory Cabin Fire Tower site, the Brownsville Tower site, and possibly a fourth unspecified location along the northeast park boundary, was the solution recommended for meeting requirements for the park radio system.



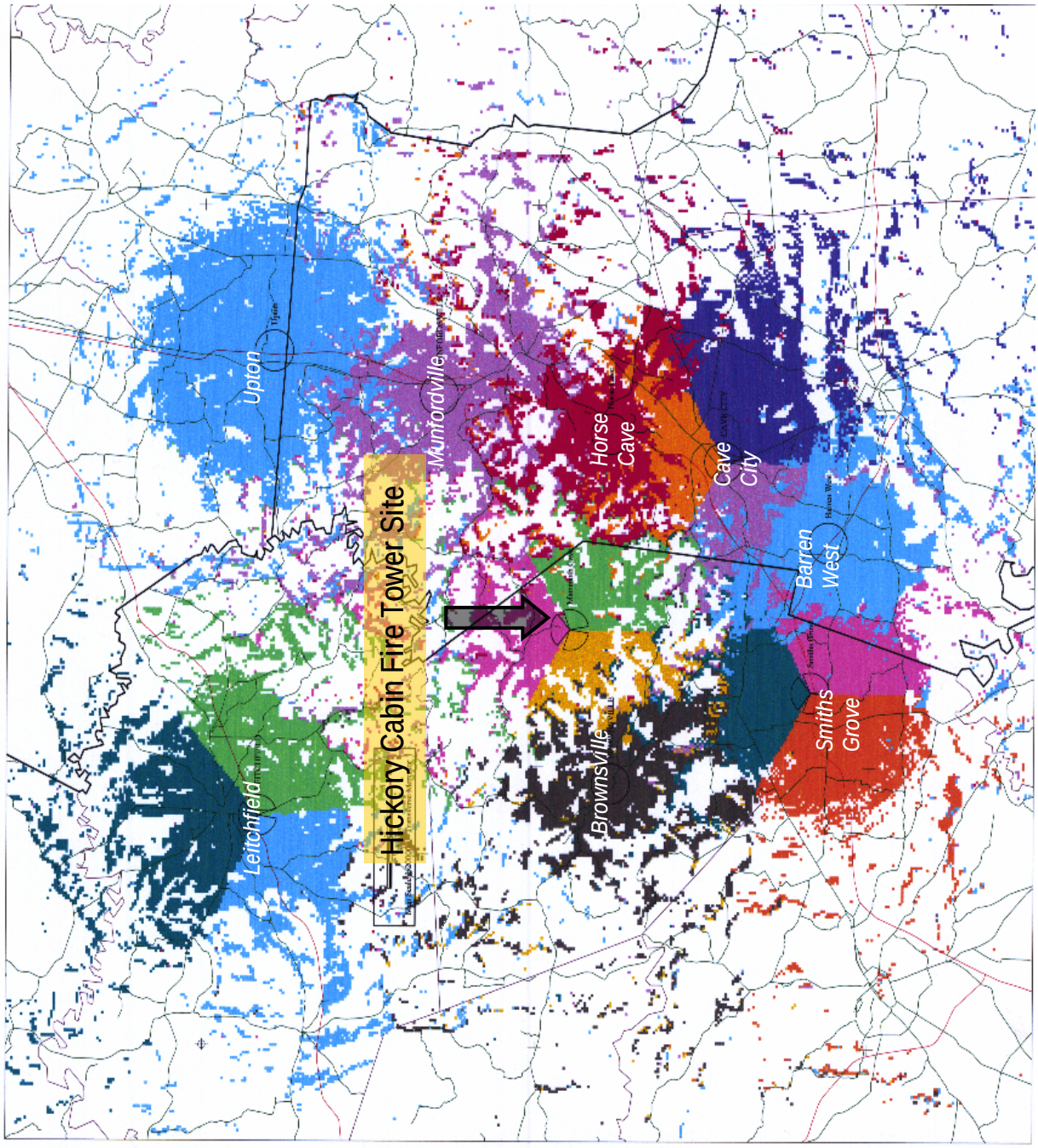
Location of Alternative Sites

Operations Area Site

Access to Operations Area Site



Service Provided by existing WTF facilities within 15 miles of Mammoth Cave National Park -- Reducing the drawings to page size makes the legends difficult to read. The shaded areas show the estimated coverage from each existing site.



Service with Addition of Hickory Cabin Fire Tower WTF Site -- The shaded areas show the estimated coverage from each existing site with the Hickory Cabin Fire Tower Site shown in the center.

Install Building Repeater(s):
This alternative would install small repeaters in buildings in the Headquarters Area to improve service in and around the buildings. This alternative was investigated by Bluegrass Cellular; however, the signal strength required for a building repeater to function is not present. Propagation studies show that both the Hickory Cabin site and the Operations Area site would provide sufficient signal strength for cellular telephone use inside buildings in the Headquarters Area. This alternative would be a viable alternative to improve service inside buildings in situations with marginal service.

Wi-Fi™ Technology *[IEEE 802.11A/B/G].*
This technology is associated mainly with data transfer using wireless Local Area Network (LAN) systems. Wi-Fi Networks operate unlicensed 2.4 and 5 gigaHertz (GHz) radio bands with similar transfer rates as Ethernet systems. It is less expensive overall because there is no hardwired network. Costs are incurred for special adapters for each piece of equipment to communicate with the Wi-Fi networks.

Presently very few Wi-Fi systems are available to the public. Most systems are used within corporate offices and are only now expanding to airports, restaurants, and other public use areas. There have been security concerns with the technology. According to the Wi-Fi Alliance, security can be implemented with several different types of security protocols.

The wireless signals have limited range, can be diminished by structural features such as walls and metal, and have potential security issues, and is mainly for data transfer. Security issues have been fixed based on industry statements. Therefore, Wi-Fi technology is inappropriate for this project because of range, possible security issues, and the needs of service.

Earth Satellite Communication Systems

Satellite based communication provides wireless communication between earth base stations and satellites (geosynchronous or low earth) in earth orbit. Information is retransmitted from the earth base to the satellite, which is then retransmitted back to another earth base station.

This type of system has a limited number of uplink and downlink beams. Transmissions received or transmitted by the earth base stations need to be transmitted to commercial users such as wireless telecommunication facility customers by a ground network system or by direct reception by individual handheld receivers. The system is expensive due to the high costs of personal handsets, the extensive costs related to the ground network that is needed to support satellite communication systems and the costs of the satellite operation, manufacture and launching.

One concept being tested by NASA is the Advanced Communications Technology Satellite (ACTS). This is called "a switchboard in the sky" because of the large number of uplink and downlink beams and is "steerable" or moved from link locations in various locations. This concept uses one very expensive satellite or a constellation (20 to 250) of cheaper satellites to complete the assignments. Several companies have indicated their intent to complete such a system, but these systems are still several years in the future. Therefore, this technology is not appropriate for this project due to limits of ground networks and costs of system infrastructure.

Personal Communication System-Over Cable (PCS-over-cable or PCS).

This technology has been operational since 1996 in several areas of the country most notably San Diego, California and Duluth, Minnesota. In these locations the phone service provider and the cable television provider joined together to offer "one stop shopping for their local customers." They would be able to provide cable TV, high-speed data communications and wireless telecommunications.

This system operates over the cable TV lines. PCS over cable is intended for a high-density population area with an extensive above ground cable system. The PCS units have limited range and would be limited even further by the dense tree cover in Mammoth Cave National Park.

There are no cable TV lines adjacent to the park. Because of the lack of television cable connection along park roads and the limitations created by dense forest cover, PCS-over-cable is not a feasible alternative for this project.

Software Defined Radio (SDR).

Using a simplified definition, SDR is a wireless communication that uses a computer to define transmitter modulation and the receiver uses a computer to recover the signals. It was initially demonstrated in a Department of Defense project in 1995.

Original estimates stated that this technology would not be generally available until 2010. The FCC issued a Notice of Inquiry requesting public comment on SDR in March 2000. In December 2000, the FCC issued a Notice of Proposed Rulemaking. Increased interest and research has allowed the estimated widespread implementation date to be moved up to approximately 2004 or 2005.

This technology is commonly referred to as 4G technology or 4th generation technology. SDR has the capability to interoperate with any of the previous technologies of generations 1G (analog), 2G (digital), 2.5G (packet switching) or 3G (packet switching with even greater transfer speeds). Presently telecommunications systems in the United States are moving from 2G to 3G technologies.

The greatest asset of SDR is its versatility. Present wireless systems employ protocols that vary from one service to another and many vary from one country to another country. Using an all inclusive software repertoire, the SDR can be set in any mode by launching the required computer program. This will allow a single radio transceiver to be used in the role of cordless phone, wireless phone, wireless fax, wireless e-mail, pager, wireless videoconferencing, wireless web browser, a GPS unit and other future functions. Because this 4G technology is not generally available, it is not feasible for this project at this time.

IDENTIFICATION OF THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

Identification of the "environmentally preferred alternative" is based on evaluation of the direct, indirect, and cumulative impacts on park resources. Cost is not a factor in the selection of the environmentally preferred alternative. The environmentally preferred alternative is the alternative

that best promotes the national environmental policy as expressed in the National Environmental Policy Act (NEPA) § 101 (b).[8] This includes alternatives that:

> fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
>
> ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
>
> attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
>
> preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
>
> achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
>
> enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment, and the alternative that best protects, preserves, and enhances historic, cultural, and natural resources.

Alternative B uses a site that is within the park development zone. There was a fire tower on this site for about 50 years. The site currently is used as a materials storage area, has an existing road access, and required utilities are available nearby and can be placed within the existing access road corridor. The proposed cell tower can be installed without additional clearing. This site offers the greatest improvement in telephone service at a location that is away from the primary visitor use areas. Because of the dense forest cover a tower at this location would not be visible from the primary visitor use areas. Other locations would not provide the same improvement in telephone service, and would involve a greater degree of impacts on the environment. Alternative B is identified as the environmentally preferred alternative because it would provide greater benefits associated with improvement of telecommunications with negligible or minor environmental impacts.

[8] U.S. Department of the Interior, National Park Service. Director's Order #12, Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making (§2.7, D.). January 2001, 22.

AFFECTED ENVIRONMENT

THE PARK IN GENERAL

Mammoth Cave National Park is located in south central Kentucky, in the counties of Edmonson, Barren, and Hart. The park is within the Second Congressional District.

In establishing Mammoth Cave National Park, Congress relied heavily on the recommendations of the Southern Appalachian National Park Commission incorporating it into Senate Report No. 823 which in turn was referenced in the Act establishing the park. The Commission recommended that the park contain 28,578 hectares including the extensive limestone caverns and associated topography, portions of the Green and Nolin rivers, and a substantial segment of the rugged landscape north of Green River. The Commission stated that the area containing these features offered

> *"exceptional opportunity for developing a great national recreational park of outstanding service in the very heart of our nation's densest population and at a time when the need is increasingly urgent and most inadequately provided for."*[9]

Today the park encompasses 21,380 hectares acquired by a combination of donations and public and private funds. Mammoth Cave National Park contains the world's longest known cave system and offers internationally renowned examples of karst topography. Many types of cave formations are present within the extensive 360 plus mile cave system. The park is part of what is believed to be the most diverse cave ecosystem in the world. Of the more than 130 species of fauna within the cave system, fourteen species of troglobites are known to exist only within Mammoth Cave and other caves in the immediate vicinity. Many of these species have been isolated from other cave systems for over a million years, resulting in fragile and unique populations. One of these species is the federally endangered Kentucky Cave Shrimp *Palaemonias ganteri*. Water of the proper quality and quantity is essential to preserving life within the cave system.

In addition to the world renowned cave system, the park is noted for its outstanding scenic rivers, valleys, bluffs, forests, and abundant wildlife. The park includes twenty-five miles of the Green River and six miles of the Nolin River. The Green River supports a diverse freshwater mussel population including six federal endangered species in addition to its role as the master stream controlling the geologic development of Mammoth Cave and its unique ecosystem.

On October 27, 1981, Mammoth Cave National Park was listed by the United Nations Educational Scientific and Cultural Organization (UNESCO) as a World Heritage Site and on March 27, 1990 as an International Biosphere Reserve. In April 1996, the Mammoth Cave Area Biosphere Reserve was officially extended and now includes lands within Barren, Butler, Edmonson, Hart, Metcalfe, and Warren counties in Kentucky.

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[9] "Final Report of the Southern Appalachian National Park Commission to the Secretary of the Interior, June 30, 1931." United States Government Printing Office. 1931, page 18.

The Rivers

The Green River and its tributary Nolin River flow through the park. These base-level streams possess one of the most diverse fish (84 species) and invertebrate fauna (51 species of mussels alone) in North America. An unused navigation dam (Lock and Dam 6) just beyond the downstream park boundary interrupts normal flow of 16.5 miles of the Green River and all of the Nolin River within the park. Habitats for eight federally listed endangered species are seriously degraded through reduction of natural flow velocity and resultant siltation. The seven federally endangered mussel species are effectively excluded from the Lock and Dam 6 impoundment because the impounded waters do not meet their habitat requirements.

Fishes

Accepted literature, museum records, and a 1990 survey by Cicerello and Hannan indicate the Green River within Mammoth Cave National Park supports 84 fish species or two-thirds of the 121 documented species from the Upper Green River drainage (Burr and Warren 1986).

Federally Listed Endangered Species

The park is located in portions of Barren, Edmonson, and Hart Counties in Kentucky. The species considered in this document are identified by the U.S. Fish and Wildlife Service as known to occur within or with the potential to occur within Mammoth Cave National Park. Species contained in the list which have no known presence within the park are indicated by insertion of (NP) following the common name.

Listed Endangered Species

Indiana Bat	*Myotis sodalis*[10]
Gray Bat	*Myotis griescens*
Red-cockaded Woodpecker (NP)	*Picoides borealis*
Bachman's Warbler (NP)	*Vermivora bachmanii*
Kirtland's Warbler (NP)	*Dendroica kirtlandii*
Kentucky Cave Shrimp	*Palaemonias ganteri*[10]
Rough Pigtoe	*Pleurobema plenum*
Clubshell	*Pleurobema clava*
Ring Pink	*Obovaria retusa*
Fanshell	*Cyprogenia stegaria*
Pink Mucket (NP)	*Lampsilis abrupta*
Orange-Foot Pimpleback (NP)	*Plethobasus cooperianus*
Cumberlandian Combshell (NP)	*Epioblasma brevidens*
Northern Riffleshell	*Epioblasma torulosa biloba*
Tubercled Blossom (NP)	*Epioblasma torulosa torulosa*
Purple Cat's Paw	*Epioblasma obliquata obliquata*
Cracking Pearly Mussel	*Hemistena lata*

[10] Critical habitat has been established within the park for these species.

Hydrology

Mammoth Cave is by far the world's longest known cave system. It is the heart of the South-central Kentucky Karst, which is an integrated set of subterranean drainage basins covering more than 644 square kilometers. The surveyed extent of Mammoth Cave currently stands at over 580 kilometers with potential to exceed 1,610 kilometers. There are more than 200 other caves within the park which are disconnected fragments of the larger system or associated with local drainage features. The geology and geography of the area has resulted in a variety of karst basins, which have become the most thoroughly understood conduit-flow aquifers in the world.

The park is bisected east to west by the Green River, which defines the hydrologic base level and divides the region into two distinct physiographic areas. North of the river an alternating series of limestones and insoluble rocks are exposed with the main limestone strata accessible only near the river an in the bottom of a few deeply incised valleys. This has resulted in rugged topography with streams that alternately flow on insoluble rocks, over waterfalls, enter caves in limestone, and resurge at springs perched on the next lower stratum of insoluble rock. The caves are numerous but are relatively smaller with smaller drainage basins when compared to Mammoth Cave. South of the Green River the surface and subsurface is defined by the Mammoth Cave karst aquifer, a component of which is the Mammoth Cave System. The complex nature of the Mammoth Cave karst aquifer is demonstrated by the number of groundwater basins, sub-basins, and intricate groundwater flow routes throughout the region. By using data from groundwater traces, we are able to identify which groundwater recharge areas contribute flow into particular points of interest, wells, springs, and caves.

The Mammoth Cave karst aquifer owes the majority of its recharge to areas outside the park boundary. This recharge, in the form of precipitation or the injection of liquid wastes, enters the aquifer through numerous sinking streams and countless sinkholes. Any practices that may have an adverse impact to water quality within the recharge area of the park can directly affect the water quality of the park.

The Mammoth Cave karst aquifer exhibits convergent flow, much like the convergent flow patterns of a dendritic surface stream system. While other aquifers may possess diffuse flow, where contaminants slowly disperse, the convergent flow of the Mammoth Cave karst aquifer would channel recharge and pollutants toward a common trunk conduit or spring.

Flow through the Mammoth Cave karst aquifer can be very rapid, on the order of hundreds to thousands of cubic meters per day. Contaminants entering the karst aquifer can thus be rapidly transported unaltered through the conduit system. The karst aquifer is very dynamic, that is, it responds nearly instantaneously to rainfall. Aquifer stage can rise 10s of meters in a matter of hours (there are numerous records showing stage rises of over 30 meters over the course of one day). In addition, chemical and bacteriological properties of the groundwater can change dramatically following rainfall events. These stage rises can activate high-level overflow routes between groundwater basins and thus direct flow in different directions depending upon aquifer conditions.

Because large portions of the upper Green River watershed and the groundwater basins affecting Mammoth Cave National park lie outside park boundaries, activities conducted in these areas

greatly influence water quality within the park. The primary activities that influence the park's water quality include: disposal of domestic, municipal, and industrial sewage; solid waste disposal; agricultural and forestry management practices; oil and gas exploration and production, urban land-use; and recreational activities.

Since a 1990-92 water quality inventory was completed, several large scale land use changes occurred. The Caveland Environmental Authority regional sewer program was completed for the Cave City and Park City areas. Hundreds of homes, dozens of businesses, and several small sewage package systems are now connected to a state-of-the-art sewage collection, conveyance, and treatment facility. In the past, during the course of the water quality inventory, each of the above producers discharges sewage on-site via septic systems, dry wells, or sinkholes, and ultimately into Mammoth Cave National Park's karst watershed. Over the past five years the US Department of Agriculture (USDA) spent nearly $1,000,000 on Best Management Practices (BMPs) specifically designed to reduce animal waste runoff in the Mammoth Cave region. A total of 83 structures were built between 1990 and 1995. Additionally, the USDA spent hundreds of thousands of dollars on other BMPs designed to reduce soil erosion and pesticide use in the Mammoth Cave area. Thus, water quality is likely improving in sections of Green River in Mammoth Cave National Park.

Specific Areas Affected by the Proposal

This EA considers three alternatives, i.e., the Hickory Cabin Fire Tower site, the Operations Area site, and a hypothetical site along Route 1827 north of the park that reflects the no action alternative.

Viewshed Impacts

A viewshed analysis was completed in November 2004. The analysis included computer modeling of the potential viewshed and line of sight profile analysis from each alternative location. A balloon test was also conducted at the Hickory Cabin Fire Tower Site. The entire viewshed analysis is attached (see Attachment 1).

The hypothetical site along Route 1827 could be located in cleared or wooded areas, but it would need to be near the roadway, which traverses the top of a narrow ridge. A tower along Route 1827 would be very visible to nearby residents and people driving through that area. If the tower was required to have aircraft warning lights, the lights would be clearly visible from many ridge top locations in the park at night (especially during the winter). The lights on existing cell towers and other structures around the park are visible form many locations in the park.

The Operations Area site currently has a radio tower that is 140 feet in height. It is not visible from nearby roads and facilities. It is only visible from the clearings in the Operations Area. Many people who have worked in the park for years don't know its there. A cellular telecommunications tower at this location would need to be 280 feet tall in order to provide service to low lying areas and those areas north of Green River. At that height, aircraft warning lights would be required. The lights would be clearly visible at night from nearby roads and the primary visitor use areas including the Visitor Center, Mammoth Cave Hotel, and Headquarters

Campground. Views from most locations of a 280 foot tower at this location would be obstructed by the dense forest vegetation.

The proposed tower at the Hickory Cabin Fire Tower site would be 185 feet above ground level. It would not be visible from locations within the park due to the dense forest vegetation. Both the computer modeling and the balloon test indicate that a tower at a height of 185 feet above ground level would not be visible from view points within the park during the summer months. It also would not be visible during the winter months when most trees do not have leaves with the following exception. People driving along the Green River Ferry Road when in close proximity (less than .25 miles) to the Hickory Cabin Fire Tower site during the winter season might catch brief glimpses of the structure through the trees if they know where to look. When there was a fire tower at the Hickory Cabin site it was not visible through the trees. The balloon test did demonstrate that the tower would not be visible from view points within the park except from within the clearing at the Hickory Cabin Fire Tower site.

The balloon was barely visible from a few view points on the high ridge along 1827 east of the Forks Store, which is located at the intersection of Route 1827 and Route 1352. At these locations there is no vegetation to obstruct the view. These locations are well outside the park, at a minimum distance of two miles from the Hickory Cabin Fire Tower site.

Wetlands and Floodplains

There are no wetlands at the alternative sites. The sites are all situated more than 300 feet in elevation above the floodplain of the Green River.

Vegetation

Vegetation at both sites is dense second growth forest. At the Hickory Cabin site, the predominant tree species is Virginia pine. The Operations Area site contains mixed hardwoods dominated by Oak, Hickory, and Black Gum trees. Impacts to vegetation were analyzed in terms of direct removal of vegetation.

Threatened and Endangered Species

Federally listed Indiana and Gray bats are likely present in caves near the alternative sites and would be expected to forage in the sites. The Indiana bat would also be expected to roost in trees in or near the alternative sites. Gray bats use caves for both their winter and summer roosts. Indiana bats establish their summer maternity colonies in trees and hibernate in caves in the winter.

Federally listed mussels are found in the Green River. At least six species of endangered mussels are known to be present in mussel beds within the park.

The Kentucky Cave Shrimp is known to be present in the caves underneath the Operations Area site. The Hickory Cabin Fire Tower site is located just east of a groundwater divide north of the Green River. Surface drainage from this site generally would enter the Big Hollow drainage basin to the south and the Ugly Creek drainage to the north and east. However, the subsurface drainage is not well defined. Therefore, it is assumed that, at least in some conditions,

groundwater from the headwaters of Big Hollow may overflow into cave streams in Running Branch Cave and Ganter Cave, which both have been documented to contain Kentucky Cave Shrimp.

Eggert's Sunflower (federally threatened) has not been found at either alternative site.

The Bald Eagle (federally threatened) is present in Mammoth Cave National Park at least seasonally, but is usually seen in or near the river valleys in the northwestern quadrant of the park and has not been seen at the alternative sites.

A federal candidate species, the Surprising Cave Beetle, is found in several caves within Mammoth Cave National Park. Neither of the alternative locations is near any of the known locations for the Surprising Cave Beetle.

Air Quality

Due to their relative proximity and regional influences, air quality is assumed to be the same at all alternative sites. Mammoth Cave National Park is a Class I area under the Clean Air Act. Based on data collected from 1991-1999, Mammoth Cave National Park ranks as the third most polluted National Park in the United States. The measures used in developing the ranking were visibility, ozone, and acid precipitation.[11] The park has recently initiated monitoring for mercury.

Soils/Geology

Soils at both alternative sites are disturbed by past agricultural uses and by the development of park facilities. A sandstone conglomerate of the Caseyville formation followed by Glen Dean and Hardinsburg sandstones, Haney limestone, Big Clifty sandstone, and Girkin and St. Genevieve limestone formations underlies the Hickory Cabin Fire Tower site. The Operations Area site is underlain with Big Clifty sandstone followed by Girkin and St. Genevieve limestone formations. The major caves in the park are located primarily in the Girkin and St. Genevieve formations. The Operations Area site is directly above portions of Mammoth Cave while there are no known caves underneath the Hickory Cabin Fire Tower site.

Water Quality and Hydrology

The Hickory Cabin Fire Tower site is located north of Green River. The surface drainage from this location generally would be into Ugly Creek and Big Hollow. Some of the runoff from the west side of the knob and access road enters the headwaters of the Dry Prong of Buffalo Creek. Surface drainage sinks quickly into the Haney limestones but is generally perched above the Big Clifty sandstone and appears along the ridge sides as springs which subsequently sink into the underlying Girkin and St. Genevieve limestones. The subsurface drainage would predominantly follow the surface water patterns except there is potential for overflow between the subsurface drainage basins during periods of increased flow resulting from heavy rainfall.

The Operations Area site is located within and near the downstream end of the Echo River groundwater basin. Surface drainage is perched above the Big Clifty Sandstone but quickly sinks

[11] Polluted Parks in Peril: The Five Most Air Polluted National Parks in the United States. Compiled by Harvard G. Ayers, Appalachian State University. Boone, North Carolina. October 2000, p. 1.

into the underlying limestone when it reaches the ridge sides and enters cave streams in Mammoth Cave.

Fish & Wildlife Other than Threatened and Endangered Species

For all alternative sites the most commonly seen wildlife in the project area are deer, squirrels, common insects, and common bird species.

Migratory Birds

A number of migratory birds pass through the park seasonally. None of the federally threatened or endangered species of migratory birds is known to be present in or to migrate through the park or any of the alternative sites. The U.S. Fish and Wildlife Service (FWS) has determined that there is a growing problem of bird collisions with communications towers. FWS has convened the Communication Tower Working Group to conduct research to determine what it is about communication towers that attracts and results in the killing of migratory songbirds. In 2000, FWS issued voluntary guidelines to be used in tower siting decisions. The guidelines encourage co-location, heights of less than 200 feet above ground level, configurations that do not require guy wires and aviation warning lights, and other measures to reduce the potential effects on migratory birds.[12] The habitats found within Mammoth Cave National Park do not encourage concentrated use by migratory birds. Instead the use by migratory birds is dispersed. The alternative sites were evaluated by a park biologist who found that "the Hickory Cabin and Ranger Station Sites do not possess characteristics making them an obvious migratory or daily movement flyway for birds. In addition, the sites are not within or near a wetland or other known bird concentration area."[13]

Cultural Resources

Archeological surveys have been completed in the Operations Area related to other development actions and no archeological sites were identified. An archeological survey of the Hickory Cabin Fire Tower site was completed on February 23, 2004 by the University of Kentucky, Program for Archeological Research (UK-PAR). No cultural resources were found at the Hickory Cabin Fire Tower Site.

If a tower at one of the alternate sites is visible from a historic property and is found to diminish the integrity of that property, then there would be an adverse effect on the property [36 CFR 800 (a)(2)(v)]. The existing radio tower as well as the tower proposed in Alternative C would be visible from individual buildings in the Operations Area that are listed on the National Register. A tower as proposed in Alternative B would not be visible from historic properties. The park has consulted with the SHPO and determined the area of potential effect for Alternative B. The Barbee Store is within the area of potential effect and is potentially eligible for the National

[12] Clark, Jamie Rappaport, Director, U.S. Fish and Wildlife Service. "Service Guidance on the Siting, Construction, Operation and Decommissioning of Communications Towers." Letter to Regional Directors. Online. Internet. http://migratorybirds.fws.gov/issues/towers/comtow.html

[13] Moore, Bill. Email, Subject: "Communication Tower/Bird Strike Site Evaluation." 26 March 2004.

Register. The SHPO has found that no potential exists for adverse impacts from the proposed tower.

Visitor Use

Both alternative sites are within park development zones and are used in support of park operations. Neither site serves as a visitor use area. Mammoth Cave National Park receives about two million visitors annually based on traffic counts, and 400,000 people annually participate in cave tours. The Operations Area site is adjacent to the primary visitor use area of the park and is located about ¼ mile from the Headquarters Campground (111 campsites) and ¾ miles from the Visitor Center and Hotel. Ten miles of developed surface trails are present south of the Green River. There are about 65 miles of backcountry trails and 13 backcountry campsites north of Green River. Park visitation is heavier in the Spring Break, Summer, and Fall Color seasons and lighter in the Winter. Use of the surface trails is highest in the spring and fall seasons. Recreational use (fishing, boating, canoeing, and camping) on the Green and Nolin Rivers in the park is heaviest in the Summer. Forever Resorts LLC operates the Mammoth Cave Hotel and associated facilities under a concession contract. The Miss Green River boat tours on the Green River are also operated under a concession contract. Two canoe liveries operate in the park under Incidental Business Permits. Double J stables is located adjacent to the park and operates guided rides in the park under an Incidental Business Permit.

Land Use

Both alternative sites are located within the park development zone. Use of either site would not require changes in land use zones. Both sites are located outside the defined Wilderness Study Areas.

Transportation

The Green River Ferry Road is an important access road for people traveling north and south through the park, for access to outdoor recreation north of the Green River, and for park operations. Although important to the park and to local residents and commuters, it does not serve as a primary transportation corridor between major population centers.

Social and Economic

Mammoth Cave National Park has been a major tourist attraction in Kentucky for over 190 years. The park generates a significant contribution to the economy of gateway communities, and is important on a statewide level. Accomplishment of the park mission is an important social and economic factor within the region.

Energy Requirements & Conservation

Commercial power is available at both alternative sites. A propane fuel generator would be provided for back-up power at either site.

Public Safety

Public safety and security is affected by the lack of telephone service in most of the park.

Public Health

There are no public health concerns associated with this project.

Indian Trust Resources

There are no Indian Trust Resources present in the park, and there is no information concerning Indian Trust Resources.

Other Benefits to the National Park Service

Other benefits include income in the form of use and occupancy fees and co-location of park radio equipment. If the Hickory Cabin Fire Tower site is the selected alternative, then the park would be able to place radio equipment at the site, and the wireless telecommunications provider would bear the cost of tower and utility construction and maintenance. The no action alternative and the Operations Area site would not provide for co-location of park radio equipment and would result in construction of a radio tower at the Hickory Cabin Fire Tower site, which would be funded by the National Park Service.

ENVIRONMENTAL CONSEQUENCES

Following is a table that summarizes the probable impacts of the alternatives related to the relevant resources or resource values that may be affected by the proposed project. The need for mitigating actions, if any, is identified for each resource value. Following the table is a narrative discussion of the effects of the proposal related to each resource or resource value.

Impacts or potential impacts have at least three important attributes: context (i.e., location in space and time), duration, and intensity or severity. In the following discussion, the terms impact, effect, and environmental consequences are used interchangeably. Impacts are direct, indirect, and/or cumulative. Impacts can be adverse or beneficial. The duration of impacts is defined as temporary (less than two years), short-term (two to five years), long-term (five to twenty years), and permanent (more than twenty years). The intensity of impacts is described using the following threshold terms: negligible, minor, moderate, major, impairment. The following descriptions of the thresholds are for natural resource issues. Analogous relative threshold factors are employed for the other issues. Negligible impacts are so minute that they have no observable effect, and parameter measurements are well within the natural range of variability. Minor impacts are detectable, parameter measurements are within the natural range of variability, but are not expected to have any long-term effects. Moderate impacts are detectable, parameter measurements are outside the natural range of variability for short periods, and changes may be long-term. Major impacts are detectable, parameter measurements are outside the natural range of variability for short to long periods, and changes may be long-term to permanent. Impairment occurs when major impacts result in significant and usually permanent effects on park resources or values as defined in Section 1.4 of the National Park Service Management Policies 2001 (December 2000, p. 11-13).

IMPACT SUMMARY TABLE:

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
EFFECTS ON VIEWSHED: Viewshed and visitor experience impacts would exist to the extent that a tower at an alternative location is visible from viewpoints within the park and nearby locations.			
Description of Attributes	Tower could be visible from viewpoints in the park depending on location, height, and lighting	Maximum height is 185 feet. Not visible from viewpoints in the park	280 feet Tall. Lights highly visible from viewpoints in the Visitor Center and HQ Area
Type of Effect	Direct	Direct	Direct
Severity	Negligible to minor	Negligible, if any	minor
Duration	Long-term to permanent	Long-term to permanent	Long-term to permanent
Mitigating Actions Needed: No lights would be placed on any above ground structure including the tower. A tower at the Alternative A or the Alternative C location would need to be less than 200 feet in height to avoid the requirement for aircraft warning lights.			
WETLANDS AND FLOODPLAINS– Impacts would occur if wetlands are dredged or filled. There are no wet lands or floodplains that would be affected at any of the alternative sites.			
Description of Attributes	No wetlands or floodplains	No wetlands or floodplains	No wetlands or floodplains
Type of Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect
Mitigating Actions Needed: None.			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
Vegetation—Impacts would include removal of trees to provide clearing for WTF, and trenching for utilities would result in severed tree roots and removal of underbrush.			
Description of Attributes	Amount of clearing for site, access, and utilities is unknown.	Site is cleared and utility trenching will be in access road corridor	10-15 trees >6-inch diameter would be removed, utilities are on site
Type of Effect	Direct	Direct	Direct
Severity	Negligible to Minor	Negligible	Negligible
Duration	Short to Long-term	Short to Long-term	Short to Long-term
Mitigating Actions Needed: Tree removal, if any, should conform to the requirements contained in the park "Hazard Tree Management Plan," approved June 20, 2000. (See discussion below concerning threatened and endangered species).			

THREATENED AND ENDANGERED SPECIES – Indiana and Gray bats likely forage in the project area and Indiana bats may roost in trees in the project area. The Bald Eagle is seldom seen in the project area. The project alternative sites are in or near groundwater basins that contain the Kentucky Cave Shrimp. Eggert's Sunflower is not present at the alternative sites, and the sites are at least ½ mile from known locations of the Surprising Cave Beetle. Impacts from noise and the presence of a structure were analyzed related to bats. Unmitigated runoff could affect the Cave Shrimp.			
Description of Attributes	Construction noise and runoff and if greater than 200 feet in height and lighted	Construction noise and runoff and 185 foot tower not lighted	Construction noise and runoff and 270-300 foot tower with lights
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Negligible / Minor if lighted	Negligible	Minor
Duration	Temporary	Temporary	Temporary
Mitigating Actions Needed: Tree removal, if any, should conform to the requirements contained in the park "Hazard Tree Management Plan," approved June 20, 2000. The plan specifies actions necessary to avoid unintentional or incidental taking of Indiana bats, i.e., trees that may provide roosting habitat for Indiana bats would be removed while the bats are hibernating in caves (November 15 to April 1) or following examination by a park biologist to ensure that bats are not roosting in the trees to be removed. Ensure adequate erosion control plan is in place and followed.			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
AIR QUALITY – Some amount of dust and particulates would be produced by construction during dry weather.			
Description of Attributes	Dust and fine particulates from construction	Dust and fine particulates from construction	Dust and fine particulates from construction
Type of Effect	Indirect	Indirect	Indirect
Severity	Negligible	Negligible	Negligible
Duration	Temporary	Temporary	Temporary
Mitigating Actions Needed: Dust should be controlled by wetting the surface if it becomes an issue during construction.			

SOILS / GEOLOGY – The primary issues are ground disturbance and erosion prevention during construction. The effect of any ground disturbance is likely permanent. The site would be graded and leveled. The amount of grading varies between the sites.			
Description of Attributes	Grading and leveling of site Rock excavation for foundations	Grading and leveling of site Rock excavation for foundations	Grading and leveling of site Rock excavation for foundations
Type of Effect	Direct	Direct	Direct
Severity	Negligible	Negligible	Negligible
Duration	Permanent	Permanent	Permanent
Mitigating Actions Needed: Adequate erosion control during construction activities would include silt fencing and check dams.			

WATER QUALITY AND HYDROLOGY – Stormwater runoff during construction could, if not mitigated, result in erosion and sedimentation.			
Description of Attributes	Erosion and downstream sedimentation	Erosion and downstream sedimentation	Erosion and downstream sedimentation
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Negligible	Negligible	Negligible
Duration	Temporary	Temporary	Temporary
Mitigating Actions Needed: Control stormwater runoff during construction to prevent erosion and downstream sedimentation.			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
FISH & WILDLIFE (other than threatened or endangered species) – Effects are primarily from noise and other disturbances during the period of construction. The impact of disturbance is expected to be minimal except during installation, which would be a relatively short period.			
Description of Attributes	Noise and disturbance	Noise and disturbance	Noise and disturbance
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Negligible	Negligible	Negligible
Duration	Temporary	Temporary	Temporary
Mitigating Actions Needed: None			

MIGRATORY BIRDS – Effects include potential for attracting migratory birds which could result in killing some birds. FWS has issued interim guidelines seeking voluntary compliance to keep towers under 200 feet in height with no aviation lights and no guy wires. There would also be noise and disturbance during construction. Threatened or endangered migratory bird species are not known to be present or to migrate through the alternative sites.			
Description of Attributes	Construction noise and disturbance. Tower height 185 feet or greater, no guy wires, aviation lights required if greater than 200 feet tall	Construction noise and disturbance Tower height 185 feet, no guy wires, aviation lights not required	Construction noise and disturbance. Tower height 280 feet, no guy wires, aviation lights are required
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Minor if lighted	Negligible	Minor
Duration	Long-term to Permanent	Long-term to Permanent	Long-term to Permanent
Mitigating Actions Needed: Insure that FWS interim siting guidelines are followed at any tower site in the park.			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
CULTURAL RESOURCES – The sites for Alternatives B and C are previously disturbed. Surveys by Archeologists found no cultural materials at either site. Historic properties or districts would be affected if a tower is visible from a property or district.			
Description of Attributes	Hypothetical Location -- Presence of Archeological resources undetermined as well as impact on historic properties	No archeological resources present – not visible from Barbee Store or historic properties in the park	No archeological resources present – visible from historic properties in Operations Area
Type of Effect	Indirect--Possible Visual Intrusion	Indirect--Possible Visual Intrusion	Indirect--Visual Intrusion
Severity	Negligible to Minor	Negligible	Minor
Duration	Permanent	Permanent	Permanent
Mitigating Actions Needed: The Kentucky SHPO has been consulted concerning Alternative B, and has found no potential for adverse impacts from the proposed tower.			

VISITOR USE – Construction work and completed tower may or may not be visible to visitors depending on location.			
Description of Attributes	Tower could be visible from some visitor use areas within the park depending on location chosen and tower height, especially if lighted	Tower would not be visible from visitor use areas within the park	Tower lights would be visible in primary visitor use areas at Park Headquarters
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Negligible to Minor	Negligible	Minor
Duration	Permanent	Permanent	Permanent
Mitigating Actions Needed: None			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
LAND USE – The proposal would not require any changes in land use or land use designations.			
Description of Attributes	Facility located outside the park.	Facility located in Development zone – not in Natural Zone or Wilderness Study Area	Facility located in Development zone – not in Natural Zone or Wilderness Study Area
Type of Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect
Mitigating Actions Needed: None. No changes in land use designation are required or needed.			

TRANSPORTATION – Moving equipment and supplies may require traffic control for safety. The roads used are not primary transportation corridors between major population centers.			
Description of Attributes	Traffic control for safe entry and exit of vehicles and equipment from site	Traffic control for safe entry and exit of vehicles and equipment from site	Traffic control for safe entry and exit of vehicles and equipment from site
Type of Effect	Indirect	Indirect	Indirect
Severity	Negligible	Negligible	Negligible
Duration	Temporary	Temporary	Temporary
Mitigating Actions Needed: Insure the contractor performs as specified to maintain traffic flow.			

SOCIAL AND ECONOMIC – The primary effects would be the improvement in telephone communications and the funds paid to contractors for work to construct the WTF. There would be an increase in air time used by consumers and, as a result, an increase in revenue to cellular telephone service providers.			
Description of Attributes	Less signal improvement in the park; greater improvement outside park	Greater improvement in signal strength in the park	Less improvement in signal strength both in and out of the park
Type of Effect	Indirect	Indirect	Indirect
Severity	Negligible Benefit	Neglibible Benefit	Negligible Benefit
Duration	Long-term to Permanent	Long-term to Permanent	Long-term to Permanent
Mitigating Actions Needed: None			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area

PUBLIC HEALTH – There are no public health concerns associated with this project. Analysis conducted by Richard A. Tell Associates, Inc. indicates there is no hazard to the public from radio frequency fields that could be generated by operation of the proposed facilities.			
Description of Attributes	No Effect	No Effect	No Effect
Type of Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect
Mitigating Actions Needed: None			

PUBLIC SAFETY – Security and safety measures would be included at each of the alternative sites. The improved telephone communications would benefit the public and park staff. In the future, enhanced 911 service would provide the ability to locate lost or injured backcountry users who have cell phones. Communications by law enforcement and emergency services agencies as well as other agencies and the Edmonson County Schools would be enhanced by improved communications.			
Description of Attributes	Improved signal strength in northern area of park and north of the park	Improved signal strength in all major visitor use areas and north of the park	Improved signal strength in some major visitor use areas with minimal improvement north of the park
Type of Effect	Direct & Indirect	Direct & Indirect	Direct & Indirect
Severity	Minor	Minor	Minor
Duration	Long-term to Permanent	Long-term to Permanent	Long-term to Permanent
Mitigating Actions Needed: None			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
INDIAN TRUST RESOURCES - There are no Indian Trust Resources in the park, and the park retains no records or other information of Indian Trust resources.			
Description of Attributes	Not Applicable	Not Applicable	Not Applicable
Type of Effect	Not Applicable	Not Applicable	Not Applicable
Severity	Not Applicable	Not Applicable	Not Applicable
Duration	Not Applicable	Not Applicable	Not Applicable
Mitigating Actions Needed: None			

RISK OF UNANTICIPATED CONSEQUENCES – Because both the alternative sites in the park (B and C) have been previously disturbed and there is existing access to both sites, the risk of unanticipated environmental effects is minimal. Any location north of and outside the park has greater risks of unanticipated consequences because there is no concrete proposal for a specific location, and, consequently, the impacts are relatively unknown.			
Description of Attributes	No construction in park—Greater risk because of hypothetical nature of this alternative	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF at Operations Area Site
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Negligible to minor risk	Negligible risk	Negligible risk
Duration	Temporary to long-term	Short-term	Short-term
Mitigating Actions Needed: None			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
OTHER BENEFITS TO THE NATIONAL PARK SERVICE – Other benefits relate to the ability to co-locate park radio equipment on the tower that would be constructed under each alternative. As described earlier, the park needs to improve its own radio system, and expects to construct a tower at the Hickory Cabin Fire Tower site in the future when funding becomes available. Funding to improve the park radio system is currently programmed in the National Park Service 5-year plan in FY2006. Once an NPS tower is constructed, it may become available for co-location by others. Lease of space on an existing tower owned by others costs approximately $18,000 at current rates. The park would receive in the range of $3,000 to $6,000 annually from Bluegrass Cellular for use and occupancy of the Hickory Cabin Fire Tower Site plus co-location on the tower at no cost. Any company that would want to co-locate on the tower proposed at the Hickory Cabin Fire Tower site would have to make their own financial agreement with Bluegrass Cellular and apply for a permit from the National Park Service and pay use and occupancy fees to the park.			
Description of Attributes	NPS constructs radio tower at Hickory Cabin site with full cost to NPS, companies may or may not choose to co-locate. WTF potentially constructed along Route 1827 would not be candidate for co-location of NPS radio equipment due to cost.	Bluegrass Cellular constructs tower at Hickory Cabin site, NPS co-locates radio equipment, receives use and occupancy fee	Bluegrass Cellular constructs new tower at Operations Area site. NPS receives use and occupancy fee
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Zero to Negligible financial benefit due to NPS construction costs, unless offset by co-location fees, but results in major improvement in park radio system	Minor financial benefit to park and major improvement in park radio system	Minor financial benefit to park and negligible improvement in park radio system – Additional tower would still be needed at Hickory Cabin Fire Tower site to provide needed radio system improvement
Duration	Permanent	Permanent	Permanent
Mitigating Actions Needed: None			

RESOURCE OR IMPACT CATEGORY	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
	No Action Hypothetical Tower Outside the Park along Route 1827	Construct WTF at Hickory Cabin Fire Tower Site	Construct WTF in Park Operations Area
CUMULATIVE IMPACTS – Cumulative impacts include other actions governmental and private that can reasonably be predicted to occur as a result of implementation of each alternative. Selection of the no action alternative could result in construction of Wireless Telecommunication Facilities immediately north of the park. WTF in the area immediately north of the park would be highly visible from the roads approaching the park. Because a WTF outside the park would not meet the park need to improve its radio system, it is likely that a tower would be constructed by the National Park Service at the Hickory Cabin Fire Tower site. The most likely cumulative impact related to Alternatives B and C is that other telecommunications companies would request to co-locate WTF on the new tower whether at the Hickory Cabin Fire Tower site or the Operations Area site. Because a tower at the Hickory Cabin Fire Tower site would also improve service outside the park, requests for co-location are more likely than for the Operations Area site. Because of existing park zoning and designation of wilderness study areas there is little potential for this to involve additional locations in the park.			
Description of Attributes	No construction or possible construction of WTF north of park and NPS construction of tower at Hickory Cabin for park radio system	More requests to co-locate WTF in the park	More requests to co-locate WTF in the park
Type of Effect	Possible direct, indirect, and cumulative	Indirect	Indirect
Severity	Minor	Minor	Negligible
Duration	Long-term to Permanent	Long-term to Permanent	Long-term to Permanent
Mitigating Actions Needed: None			

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The following discussion summarizes the likely effects of the alternatives for each resource or resource value evaluated in this environmental assessment. Cumulative effects and impairment are also discussed for each resource category.

Cumulative effects are the additional actions by any entity that can reasonably be predicted to occur as a result of the proposed action. Cumulative impact is defined by the Council on Environmental Quality regulations in 40 C.F.R. Section 1508.7 as:

> "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

The meaning of impairment is spelled out in the National Park Service (National Park Service) Organic Act of 1916 (16 USC 1); the National Park Service General Authorities Act of 1970, including amendments in 1978 (16 USC 1a-1); and the National Park Service Management Policies 2001 (Section 1.4). Impairment means impact(s)

> "that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts."[14]

The effects of both Alternatives B and C on most resources or resource values are similar, if not identical, because each alternative requires a comparable level of construction on previously disturbed sites. In the following discussion of the environmental consequences, they are referred to collectively as the proposal. In cases where there is a discernable difference in the effects of the action alternatives, they are identified separately.

VIEWSHED IMPACTS

Viewshed and visitor experience impacts would exist to the extent that a tower at an alternative location is visible from viewpoints within the park and nearby locations.

[14] National Park Service Management Policies 2001, Section 1.4.5. December 2000, p. 12.

Alternative A: No Action. One possible consequence of selection of the no action alternative, i.e., no wireless telecommunications facilities in the park, is construction of a tower outside the park. The location is hypothetical because a tower in the area north of the park has not been proposed. A tower along Route 1827 north of the park could have viewshed impacts in the park particularly if a tower is constructed at a height requiring aviation warning lights. The effects could range from negligible to minor and would be long-term to permanent.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The balloon test and viewshed analysis (see Attachment 1) completed for this location indicate that during the summer months a tower 185 feet tall at this location would not be visible from viewpoints in the park. In the winter, people traveling on the Green River Ferry Road when in close proximity (less than 0.25 miles) to the Hickory Cabin Fire Tower site might catch brief glimpses of the structure through the trees if they know where to look. Aviation warning lights would not be required. The effects, if any, would be negligible, and would be long-term to permanent.

Alternative C: Construct WTF in Park Operations Area. A tower at this location would be approximately 280 feet tall, and would require aviation warning lights. The viewshed analysis showed it would not be highly visible during the daytime; however, the aviation warning lights would be highly visible in the Headquarters Campground and at the Visitor Center and Hotel. The effects would be minor, and would be long-term to permanent.

Impairment. The alternatives considered would not impair park viewsheds.

Cumulative Effects. There are no measurable cumulative effects.

WETLANDS AND FLOODPLAINS

There are no wet lands that would be affected at any of the alternative sites. Each alternative site is more than 300 feet in elevation above the Green River floodplain. The proposal would not affect wetlands or floodplains.

Alternative A: No Action. The no action alternative would not affect wetlands or floodplains.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. Alternative B would not affect wetlands or floodplains.

Alternative C: Construct WTF in Park Operations Area. Alternative C would not affect wetlands or floodplains

Impairment. The alternative considered would not impair wetlands or floodplains.

Cumulative Effects. There are no measurable cumulative effects on wetlands or floodplains.

VEGETATION

Vegetation at the alternative sites is second growth. At the Hickory Cabin Fire Tower site a major component is planted Virginia pines. At the Operations Area site the dominant trees are

oak, hickory, and black gum. Tree removal would not be required at the Hickory Cabin Fire Tower site. At the Operations Area site, at least 10-15 trees greater than 6 inches in diameter would have to be removed to provide adequate cleared area. Trenching for utilities would result in severed tree roots and removal of underbrush. The impact on vegetation would be negligible and short-term.

Alternative A: No Action. Because a location has not been proposed north of the park, it is not possible to determine potential impacts on vegetation. The amount of clearing needed could range from none up to 0.5 acres or more if the site and access route covered with dense forest. The impact on vegetation could range from negligible to minor and short-term to long-term.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The existing access road and clearing are adequate for construction of the proposed facilities without additional clearing. The impact on vegetation would be negligible and short-term to long-term.

Alternative C: Construct WTF in Park Operations Area. At least 10-15 trees greater than 6 inches in diameter would have to be removed to provide adequate cleared area for a new tower in the Operations Area. The effect on vegetation would be negligible and short-term to long-term.

Impairment. The alternatives would not impair vegetation or natural processes.

Cumulative Effects. There are no measurable cumulative effects on vegetation because of the proposal.

THREATENED AND ENDANGERED SPECIES

Indiana and Gray bats (endangered) are likely to forage in the project area, and Indiana bats may roost in trees in or near the alternative sites from April 1 through November 15 annually. The primary effect from construction and operation of the facility would be noise. It is anticipated that few trees would be removed. Removal of trees would be performed under the guidelines in the park Hazard Tree and Vegetation Management Plan which was developed in consultation with the U.S. Fish and Wildlife Service and specifies conditions for removal of trees to prevent the inadvertent taking of Indiana bats.[15] The proposal is not likely to adversely affect Indiana or Gray bats.

The Bald Eagle (threatened) has a transient presence in all alternative sites, but is seldom seen. No effects are expected related to the Bald Eagle.

The Operations Area site is within the Echo River groundwater basin that contains the Kentucky Cave Shrimp (endangered). The Hickory Cabin Fire Tower site is on the north side of the river and near a divide between two groundwater basins. The potential effects are related to runoff from the sites during construction. Adequate controls are needed to prevent erosion and sedimentation as well as to capture any spills of hazardous materials. It is expected that standard erosion control methods would be installed early in the construction period, which would further reduce the chances of sediments or hazardous materials entering the groundwater from the site.

[15] See Mammoth Cave National Park Standard Operating Procedures Handbook, Section H. Chapter 1. See also Mammoth Cave National Park Impact Assessment file IA-0003, "Revise Hazard Tree and Vegetation Management Plan."

Stormwater runoff from the sites is not likely to enter cave streams directly because both locations are ridge top sites. No adverse effects are expected related to the Kentucky Cave Shrimp.

The alternative sites are more than a half mile away from the Green River, which provides habitat for endangered mussels. As noted earlier, some of the species may no longer be present. The proposal is not likely to have adverse effects on endangered mussel species.

The Surprising Cave Beetle (candidate for federal endangered status) is located in caves which are more than one mile from either of the alternative sites. The proposal is not likely to affect the Surprising Cave Beetle.

Informal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act will be completed before a final decision is made. The draft environmental assessment will be used as the basis for consultation rather than a separate biological assessment.

In summary, the proposal is not likely to adversely affect other threatened and endangered species.

Alternative A: No Action. Construction of a tower along Route 1827 is a potential result of the no action alternative. Because there is no specific proposal for a tower along Route 1827, it is unknown whether a hypothetical tower would or would not meet the interim siting guidelines published by the U.S. Fish and Wildlife Service. Effects could range from negligible to minor (if lighted) and temporary to permanent.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. This alternative conforms to the U.S. Fish and Wildlife Service siting guidelines. Informal consultation has been completed for this alternative with a determination that it is not likely to adversely affect threatened and endangered species. Effects would be negligible and temporary.

Alternative C: Construct WTF in Park Operations Area. A tower at this location would need to be 280 feet tall and would require aircraft warning lights. A lighted tower of this height could conform to the U.S. Fish and Wildlife Service siting guidelines, but would not be less desirable than a tower that did not require lights. Effects would be minor and temporary.

Impairment. The proposal would not impair threatened and endangered species. The no action alternative would not impair threatened and endangered species.

Cumulative Effects. The proposal is not expected to produce any measurable cumulative effects related to threatened and endangered species.

AIR QUALITY

The primary effects would be dust and fine particulates produced by construction activities in dry weather. Controls are required to prevent production of excessive amounts of dust. Water would be used to wet the surface to prevent dust. The effects are expected to be negligible and temporary.

Alternative A: No Action. The effects of the no action alternative including construction of a hypothetical tower outside the park are expected to be negligible and temporary.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The effects are expected to be negligible and temporary.

Alternative C: Construct WTF in Park Operations Area. The effects are expected to be negligible and temporary.

Impairment. The proposal would not impair air quality. The no action alternative would not impair air quality.

Cumulative Effects. There are no measurable cumulative effects on air quality because of the proposal.

SOILS AND GEOLOGY

The primary issues are ground disturbance and erosion prevention during construction. Appropriate erosion and sedimentation control measures would be in place at all times. The soils at each of the alternative locations have been previously disturbed by agricultural and construction activities. Some rock excavation is anticipated for the tower foundations. Rock excavation would be accomplished using impact tools. Blasting would not be permitted within the park but might be permitted at locations outside the park. Except for the impact of blasting, the same level of disturbance would be expected at each of the alternative locations.

Alternative A: No Action. The effects on geology and soils are expected to be negligible but permanent.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The effects on geology and soils are expected to be negligible but permanent.

Alternative C: Construct WTF in Park Operations Area. The effects on geology and soils are expected to be negligible but permanent.

Impairment. The proposal would not impair soils and geology. The no action alternative would not impair soils and geology.

Cumulative Effects. There are no measurable cumulative effects on soils and geology.

WATER QUALITY AND HYDROLOGY

Stormwater runoff during construction, if not properly mitigated with silt fencing or other erosion control devices, could result in erosion and sedimentation. Silt fencing and check dams will be utilized to prevent erosion and sedimentation. Each alternative would have approximately the same effects on water and hydrology.

Alternative A: No Action. The effects of the no action alternative is expected to be temporary and negligible.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The effects are expected to be temporary and negligible

Alternative C: Construct WTF in Park Operations Area. The effects are expected to be temporary and negligible.

Impairment. The proposal would not impair water quality and hydrology. The no action alternative would not impair water quality and hydrology.

Cumulative Effects. There would be no cumulative effects related to water quality and hydrology.

FISH AND WILDLIFE (OTHER THAN THREATENED OR ENDANGERED SPECIES)

The effects are similar to the effects on threatened or endangered species. However, abundant species would be present near the construction areas and would be exposed to the construction disturbance, i.e., noise and presence of people and equipment. The effects are expected to be negligible and temporary.

Alternative A: No Action. The effects are expected to be negligible and temporary.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The effects are expected to be negligible and temporary.

Alternative C: Construct WTF in Park Operations Area. The effects are expected to be negligible and temporary.

Impairment. The proposal would not impair fish and wildlife. The no action alternative would not impair fish and wildlife.

Cumulative Effects. There would be no measurable cumulative effects on fish and wildlife.

MIGRATORY BIRDS

In 2000, the U.S. Fish and Wildlife Service issued voluntary guidelines to be used in tower siting decisions. The guidelines encourage co-location, heights of less than 200 feet above ground level, configurations that do not require guy wires and aviation warning lights, and other measures to reduce the potential effects on migratory birds. The effects of construction on migratory birds are primarily noise and other physical disturbance during the period of construction. No threatened and endangered migratory bird species are known to be present or to migrate through the sites.

Alternative A: No Action. The effects from construction of a tower along Route 1827 would be likely to range from negligible to minor depending on the height, lighting, and other attributes. Construction is expected to produce temporary negligible effects on migratory birds.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. Alternative B would construct a tower 185 feet in height above ground level and would conform to the FWS guidelines. The effects from Alternative B on migrating birds would be negligible but long-term to permanent. Construction is expected to produce temporary negligible effects on migratory birds.

Alternative C: Construct WTF in Park Operations Area. Alternative C would construct a tower approximately 280 feet in height above ground level and would therefore require aviation warning lights which would be more likely to attract night migrating birds. Even though the FWS interim guidelines allow lights on towers of this height, Alternative C would be more likely to result in a higher frequency of bird strikes. The effects are expected to be minor and long-term to permanent. Construction is expected to produce temporary negligible effects on migratory birds.

Impairment. The proposal would not impair migratory birds. The no action alternative would not impair migratory birds.

Cumulative Effects. There would be no measurable cumulative effects on migratory birds.

CULTURAL RESOURCES

Archeological surveys and surveys for historic properties that might be affected by a proposal are required to complete the requirements under Section 106 of the National Historic Preservation Act. There is a comprehensive agreement between Mammoth Cave National Park, the State Historic Preservation Officer (SHPO), and the Advisory Council related to compliance and consultation.

Alternative A: No Action. The effects for a tower that could be built along Route 1827 as a result of a decision not to permit construction within the park are unknown. The effects could range from negligible to minor and would be permanent.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. An archeological survey of the Hickory Cabin Fire Tower area was completed on February 23, 2004 by the University of Kentucky Program for Archeological Research. No cultural resources were found. A survey for historic properties was completed for the Area of Potential Effect (APE). One structure, i.e., the Barbee Store, was found to be potentially eligible for the National Register. The SHPO found that no potential exists for adverse impacts from the proposed tower at the Hickory Cabin Fire Tower site. The effects are expected to be negligible and permanent.

Alternative C: Construct WTF in Park Operations Area. The Operations Area site has been examined by archeologists in conjunction with other previous construction actions, and there are no archeological resources in that area; however, historic buildings are present that would be within the viewshed. Effects are expected to be minor and permanent.

Impairment. The proposal would not impair cultural resources. The no action alternative would not impair cultural resources.

Cumulative Effects. There would be no measurable cumulative effects on cultural resources.

VISITOR USE

Alternative A: No Action. A tower along Route 1827 would be highly visible to visitor approaching the park. The effects are expected to range from negligible to minor and would be permanent. The construction effects related to visitor use would be negligible and temporary.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The tower proposed for the Hickory Cabin Fire Tower site would not be visible to visitors from within the park, and would have no effect on visitor experience. The Hickory Cabin Fire Tower site is several miles from the Visitor Center and other primary visitor use areas. The dense forest cover limits visibility. At a height of 185 feet, the tower would not have aircraft warning lights. The effects on visitor experience, if any, would be negligible and permanent. The construction effects related to visitor use would be negligible and temporary.

Alternative C: Construct WTF in Park Operations Area. Because of its greater height, 280 feet, it would be required to have warning lights. At night the lights would be highly visible in the Headquarters Campground and the Hotel and Visitor Center area as well as other nearby locations. The effects on visitor experience from a tower in the Operations Area site would be minor but permanent. The construction effects related to visitor use would be negligible and temporary.

Cumulative Effects. There would be no measurable cumulative effects related to visitor use.

LAND USE

No park locations outside the established development zones would be considered for construction of wireless telecommunications facilities.

Alternative A: No Action. No effects are expected.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. This alternative would not require any changes in land use or land use designations.

Alternative C: Construct WTF in Park Operations Area. This alternative would not require any changes in land use or land use designations.

Cumulative Effects. The proposal would have no measurable cumulative effects related to land use.

TRANSPORTATION

The sites are not near major transportation routes. Temporary negligible effects on traffic in the immediate vicinity of each site would be anticipated when moving equipment and materials. The effects would last only a few minutes for each event.

Alternative A: No Action. The effects would be negligible and temporary.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The effects would be negligible and temporary.

Alternative C: Construct WTF in Park Operations Area. The effects would be negligible and temporary.

Cumulative Effects. There would be no measurable cumulative effects on transportation.

SOCIAL AND ECONOMIC

The primary social and economic issue is improvement of cellular telephone service, which would also result in improved visitor safety and security. The construction funds that would be paid for construction of the facilities would enter the economy in a variety of ways.

Alternative A: No Action. A location along Route 1827 would improve cellular telephone service in the area north of the park and in the northern areas of the park, but would not provide improvement in the central areas of the park. The amount of funds would be negligible, and the effects are expected to be negligible and long-term to permanent.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The Hickory Cabin Fire Tower site would provide greater telecommunications benefits than the Operations Area site. The amount of funds would be negligible, and the effects are expected to be negligible and long-term to permanent.

Alternative C: Construct WTF in Park Operations Area. The telecommunications benefits would be greatest in the central area of the park, but there would be little benefit for areas north of the park. The amount of funds would be negligible, and the effects are expected to be negligible and long-term to permanent.

Cumulative Effects. There would be no measurable cumulative social or economic effects.

PUBLIC HEALTH

Alternative A: No Action. A wireless telecommunications facility at a hypothetical location along Route 1827 would not affect public health.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. There would be no effect on public health.

Alternative C: Construct WTF in Park Operations Area. There would be no effect on public health.

Cumulative Effects. There would be no measurable cumulative effects related to public health.

PUBLIC SAFETY

Security and safety measures would be incorporated in the facility regardless of which site is selected. The proposal would have beneficial effects on public safety by providing telephone service in the major visitor use areas of the park.

Alternative A: No Action. The beneficial effects inside the park would be negligible but overall the effects would be minor and permanent. There would be little improvement in telephone service in the central area of the park.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The beneficial effects would be minor but permanent. This location would improve telephone service in the visitor use areas in the center and northern areas of the park and provide improved service in the area north of the park.

Alternative C: Construct WTF in Park Operations Area. The beneficial effects would be minor but permanent. Facilities at the Operations Area would improve telephone service in the center of the park with less improvement in the northern areas of the park and little to no improvement north of the park.

Cumulative Effects. There is potential for cumulative beneficial effects related to public safety. After enhanced 911 service is provided in the future, it will become possible to locate lost or injured backcountry users from their cellular telephone signal. The cumulative effects would be minor but long-term or permanent.

INDIAN TRUST RESOURCES

There are no Indian Trust resources in the park and the park retains no records or other information related to Indian Trust resources.

Alternative A: No Action. There would be no effect on Indian Trust resources.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. There would be no effect on Indian Trust resources.

Alternative C: Construct WTF in Park Operations Area. There would be no effect on Indian Trust resources.

Cumulative Effects. There would be no cumulative effects related to Indian Trust resources.

RISK OF UNANTICIPATED CONSEQUENCES

Alternative A: No Action. Because of the well known attributes of wireless telecommunications facilities the risk of unanticipated consequences is limited. This alternative carries a higher risk of unanticipated consequences than alternatives B and C because it is a hypothetical and there is no specific proposal for location, height, and other attributes. The range of the risk of unanticipated consequences is negligible to minor and temporary to long-term.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. Because of the well known attributes of wireless telecommunications facilities, the relative ease of connection to existing utilities, and the existing road access to the site, the risk of unanticipated consequences is limited. Adequate contract supervision and project inspection to insure the work remains on schedule would mitigate the remaining uncontrolled risks. The risk of unanticipated consequences is negligible and short-term.

Alternative C: Construct WTF in Park Operations Area. Because of the well known attributes of wireless telecommunications facilities, the relative ease of connection to existing utilities, and the existing road access to the site, the risk of unanticipated consequences is limited. Adequate contract supervision and project inspection to insure the work remains on schedule would mitigate the remaining uncontrolled risks. The risk of unanticipated consequences is negligible and short-term.

Impairment. There would be no impairment associated with the risk of unanticipated consequences.

Cumulative Effects. There are no reasonably discernable cumulative effects related to unanticipated consequences. The no action alternative would have no cumulative effects.

OTHER BENEFITS TO THE NATIONAL PARK SERVICE

Other benefits relate to the ability to co-locate park radio equipment on the tower that would be constructed under each alternative. As described earlier, the park needs to improve its own radio system, and expects to construct a tower at the Hickory Cabin Fire Tower site in the future when funding becomes available. Funding to improve the park radio system is currently programmed in the National Park Service 5-year plan in FY2006. Once an NPS tower is constructed, it may become available for co-location by others. Lease of space on an existing tower owned by others costs approximately $18,000 at current rates. Any company that would want to co-locate on the tower proposed at the Hickory Cabin Fire Tower site would have to make their own financial agreement with Bluegrass Cellular and apply for a permit from the National Park Service and pay use and occupancy fees to the park.

Alternative A: No Action. Bluegrass Cellular of other wireless telecommunications provider would construct a tower somewhere north of the park. Beyond improved telephone service in the northern area of the park, there would be no additional benefits to the National Park Service. The park would not co-locate its radio equipment on a tower in the Route 1827 area because analysis by Motorola indicates this location which would be two or more miles north of the Hickory Cabin Fire Tower Site would not provided the needed radio coverage. Consequently, the National Park Service would construct its own radio tower at the Hickory Cabin Fire Tower Site in order to provide the needed improvements in the park radio system, and would bear the full cost of tower construction and maintenance. The effects would be negligible, if any, and permanent.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. The park would receive in the range of $3,000 to $6,000 annually from Bluegrass Cellular for use and occupancy of the Hickory Cabin Fire Tower Site plus co-location on the tower at no cost. The National Park Service would pay for park radio equipment, and Bluegrass Cellular would bear all construction and maintenance costs for the tower and utilities. There would be minor financial benefits to the park and a major improvement in the radio system. The effects would be long-term to permanent.

Alternative C: Construct WTF in Park Operations Area. The park would receive in the range of $3,000 to $6,000 annually from Bluegrass Cellular for use and occupancy of the Operations Area Site plus co-location on the tower at no cost. The National Park Service would pay for park radio equipment that would be relocated from the existing tower, and Bluegrass Cellular would bear all construction and maintenance costs for the tower and utilities. The National Park Service would construct a radio tower at the Hickory Cabin Fire Tower Site in order to provide the needed improvements in the park radio system, and would bear the full cost of construction and maintenance the tower and facilities. There would be negligible financial benefits to the park and negligible benefit for the radio system. The effects would be long-term to permanent.

Impairment. There would be no impairment associated with the other benefits to the National Park Service.

Cumulative Effects. There are no reasonably discernable cumulative effects related to the identified benefits to the National Park Service.

CUMULATIVE IMPACTS

Cumulative impact is defined by the Council on Environmental Quality regulations in 40 C.F.R. Section 1508.7 as:

> "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

The future implementation of enhanced 911 service would allow lost or injured visitors to be located using their cellular telephone signal. The co-location of equipment at the site on the park of other telecommunication providers and co-location of park radio communications equipment is considered to be a part of the proposal and not a cumulative effect.

The potential for future installation of a wireless local area network (LAN) in the developed Headquarters Area is not a cumulative effect of this proposal. It would be a separate development that would provide access to the Internet in the Visitor Center and Mammoth Cave Hotel area.

Alternative A: No Action. The no action alternative could result in construction of a Wireless Telecommunication Facility (WTF) on the ridge north of the park.

Alternative B: Construct WTF at Hickory Cabin Fire Tower Site. No cumulative effects have been identified. A decision to issue a permit for this site would not set a precedent for other sites at Mammoth Cave National Park or other National Park areas.

Alternative C: Construct WTF in Park Operations Area. No cumulative effects have been identified. A decision to issue a permit for this site would not set a precedent for other sites at Mammoth Cave National Park or other National Park areas.

Impairment. There would be no impairment of resources related to the cumulative effects of the proposal. The no action alternative would not result in impairment of resources.

SUMMARY OF MITIGATING ACTIONS

The following list restates the mitigating actions identified in the preceding discussion of the likely environmental consequences of the proposal. These are the important conditions that will be utilized to limit the potential for unexpected adverse consequences. These conditions will be included in any permit issued for wireless telecommunication facilities at the Hickory Cabin Fire Tower site.

1. Implement the U.S. Fish and Wildlife Service interim siting guidelines to minimize the risk to migratory birds.

2. Tree removal would conform to the park "Hazard Tree Management Plan" (approved June 20, 2000). The park completed formal consultation with the U.S. Fish and Wildlife Service before approval of the plan. The primary issue is protection of Indiana bats. Any trees to be removed should be removed when Indiana bats are hibernating in caves (November 15th to March 31st) and therefore are unlikely to be roosting in trees.
3. Dust should be controlled by wetting the surface if it becomes an issue during construction.
4. Erosion and sedimentation control measures should be in place to prevent movement of soils from the site into caves.
5. A Construction Stormwater Discharge Permit would be obtained, if required, along with any other required construction permits.
6. Effective construction management and supervision should be provided to insure that public safety and other concerns related to construction are properly addressed, and that any contractors perform as specified.
7. No lights would be placed on the tower or any other above ground structure except for work lights that may be turned on temporarily as needed to perform maintenance and repairs.
8. The right of way permit would require that Bluegrass Cellular and any other non-governmental entity who may apply to co-locate facilities on the tower would incur all costs of construction, installation, and maintenance of the facilities.
9. Expansions or alterations to the proposed construction as presented in this environmental assessment are prohibited unless and until prior written notice is submitted to the National Park Service; the appropriate level of public input, compliance with the National Environmental Policy Act, the Endangered Species Act, the National Historic Preservation Act, and other related administrative and legislative requirements has been completed; and the expansions or alterations are approved in writing by the National Park Service.

CONSULTATION AND COORDINATION

Kentucky State Clearinghouse in the Kentucky Natural Resources and Environmental Protection Cabinet (The clearinghouse is expected to distribute copies to the following Kentucky State Agencies.):

- Division of Water
- Division of Waste Management
- Division for Air Quality
- Division of Forestry
- Nature Preserves Commission
- Division of Conservation
- Department for Natural Resources
- Department of Fish and Wildlife Resources

United States Fish and Wildlife Service, Kentucky Field Office in Frankfort, Kentucky

Kentucky State Historic Preservation Officer

Mr. Scott McCloud, Vice President, Wireless Networks, Bluegrass Cellular

BellSouth Personal Communications, LLC

PUBLIC INVOLVEMENT

The Draft Environmental Assessment was available for public review and comment for a period of thirty days beginning on June 7, 2004. A press release was issued to announce the availability of the draft document for public review and to seek public involvement in the 106 process. The availability of the document was published in newspapers of local and regional circulation. A notice was placed in the Federal Register announcing the availability of the environmental assessment. The document was posted on the Mammoth Cave National Park Internet site. Hard copies were sent to the agencies and individuals listed above. Hard copies were available to the public on request.

The revised draft environmental assessment was also available for a thirty day comment period ending on February 7, 2005.

Copies of the letters and other correspondence received are attached to the environmental assessment (See Attachment 9).

PREPARERS

Henry Holman, Management Assistant, Mammoth Cave National Park

ATTACHMENTS

1. Viewshed Analysis
2. Copy of February 19, 2004 letter from Bluegrass Cellular including copy of Cellular License to Kentucky RSA #3 Cellular General Partnership
3. Wilderness Study Map
4. 7.5 minute topographic maps of the alternative locations
5. Section 7, Endangered Species Act compliance (will be added when consultation is complete)
6. Section 106, National Historic Preservation Act compliance (will be added when consultation is complete)
7. Letter from Richard Tell Associates, Inc., February 27, 2004, containing "Analysis of RF emissions associated with proposed Bluegrass Cellular cellular telephone tower in Mammoth Cave National Park" including resume
8. Agency Comments -- Any comments received will be added following the review period. No comments were received during the first review period that ended on July 15, 2004.
9. Public Comments – Additional comments received during the current public review period will be added to the comments previously received.

REFERENCES

16 USC 1-5

36 CFR Part 14

Barr, Thomas C., Jr. Final Technical Report to the National Park Service; Contract No. CX500050204; "Ecological Effects of Water Pollutants in Mammoth Cave." University of Kentucky. Lexington, Kentucky, December 1976, 45 pages.

Cellular License – KNKN867 – Kentucky RSA #3 Cellular General Partnership. Online. Internet, Federal Communications Commission Universal License Search at http://wireless2.fcc.gov/UlsApp/UlsSearch/license.jsp?licKey=13248&printable.

Cicerello, Ronald R. and Richard R. Hannan. 1990. Survey of the Freshwater Unionids (Mussels) (Bivalvia: Maragraitiferidae and Unionidae) in the Green River in Mammoth Cave National Park, Kentucky. Technical Report prepared for Mammoth Cave National Park, National Park Service, United States Department of The Interior, Mammoth Cave, Kentucky.

Clark, Jamie Rappaport, Director, U.S. Fish and Wildlife Service. "Service Guidance on the Siting, Construction, Operation and Decommissioning of Communications Towers." Letter to Regional Directors. 11 March 2004. Online. Internet at http://migratorybirds.fws.gov/issues/towers/comtow.html.

Executive Order 13186 of January 10, 2001. Responsibilities of Federal Agencies to Protect Migratory Birds. Federal Register: January 17, 2001 (Volume 66, Number 11) page 3853-3856. Online. Internet, Federal Register via GPO Access at http://www.gpoaccess.gov/fr/.

Pearson, William D. and Thomas G. Jones. A Final Report Based on a Faunal Inventory of Subterranean Streams and Development of a Cave Aquatic Biological Monitoring Program Using a Modified Index of Biotic Integrity. Draft in Mammoth Cave National Park files. University of Louisville, Louisville, Kentucky, August 1998, 78 pages.

Poulson, Thomas L. Management of Biological Resources in Caves. Copy from an unidentified publication found in the Mammoth Cave National Park files, pages 46-52.

Prentice, Guy. Archaeological Overview and Assessment of Mammoth Cave National Park. National Park Service, Southeastern Archaeological Center, Tallahassee, Florida, 1993.

Reference Manual-53: Special Park Uses, Rights-of-Way, Wireless Telecommunication Facilities. Appendix 5, Exhibit 6.

Tell, Richard A. Analysis of RF emissions associated with proposed Bluegrass Cellular cellular telephone tower in Mammoth Cave National Park. Letter, 27 February 2004.

Trader, Patrick D. Letter Report for Phase I Archaeological Survey for Hickory Cabin Cell Tower. Letter, 27 February 2004.

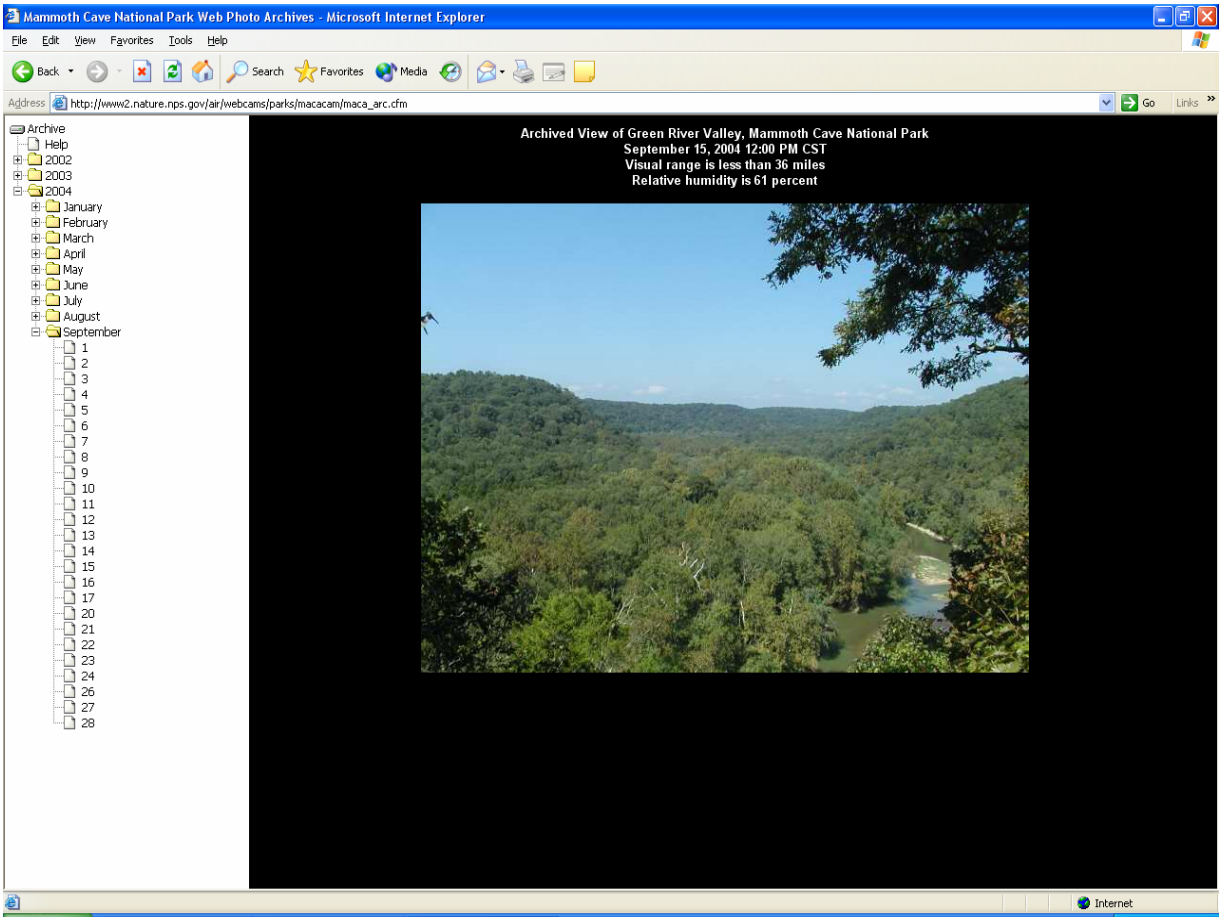
Viewshed Analysis

Viewshed analysis was conducted in response to a comment received during the first public review period for a draft environmental assessment that ended on July 15, 2004. The viewshed analysis consisted of computer modeling and a balloon test. Computer modeling was completed by park staff between September 2004 and November 2004. Digital topographic data from the Shuttle Radar Topography Mission was used for modeling topography. SRTM data was used because it is believed to be more accurate than the circa 1960 elevation data shown on U.S. Geological Service topographic maps.

Arc View GIS software was used to generate a standard viewshed analysis that predicts the locations from which the top of the tower would be visible. This analysis did not include the dense forest vegetation that obstructs the view. The blue shaded areas are the locations where an observer's view of the tower is not obstructed by the land surface. Profile data derived from Arc View was used to produce line of sight profiles with elevation data at 100 foot intervals. These profiles were exported in a spreadsheet format, and Microsoft Excel was used to generate the graphic profiles which are attached. The view points used for the line of sight profiles were selected to provide a representative sample, and included locations of particular concern. Tree height was modeled at 75 feet above ground level.

A balloon test was conducted on September 15, 2004. A helium balloon with a diameter of 5.5 feet was tethered at a height of 195 feet (10 feet higher than the proposed tower) above the Hickory Cabin Fire Tower site. The effect of the tethered balloon test was to provide direct observation of the visibility of a facility of this height independent of any error that might exist in the topographic data used for modeling. There was very good visibility on September 15, 2004. As shown in the image that follows taken from the park visibility camera the visual range throughout the day was at or above 30 miles. During the balloon test, winds generally were from the southeast with wind speeds (recorded every five minutes) that ranged from 3.29 to 6.16 miles per hour. The park monitors visibility as part of the air quality monitoring program, and the public can view images from the visibility camera and current weather and pollution monitoring data on the Internet at http://www2.nature.nps.gov/air/webcams/parks/macacam/macacam.htm.

Balloon tests were not conducted at either the Operations Area site or the theoretical site along Route 1827 north of the park. In order to avoid misperception by anyone who might see the maps associated with this viewshed analysis and the environmental assessment, it is important to mention that the discussion of a location along Route 1827 is included in the analysis in response to a comment received during the first public comment period. A location was selected that would be representative of the options that might be available for location of a cellular telephone tower somewhere on the ridge north of the park. Inclusion of a location for this alternative in this analysis and in the revised environmental assessment should not be interpreted to indicate any intent to locate a tower at that location.



Results

The hypothetical site along Route 1827 could be located in cleared or wooded areas, but it would need to be near the roadway, which traverses the top of a narrow ridge. A tower along Route 1827 would be very visible to nearby residents and people driving through that area. If the tower was required to have aircraft warning lights, the lights would be clearly visible in many areas of the park at night (especially during the winter) as are the lights on existing cell towers and other structures around the park.

The Operations Area site currently has a radio tower that is 140 feet in height. It is not visible from nearby roads and facilities. It is only visible from the clearings in the Operations Area. Many people who have worked in the park for years don't know its there. A cellular telecommunications tower at this location would need to be 280 feet tall in order to provide service to low lying areas and those areas north of Green River. At that height, aircraft warning lights would be required. The lights would be clearly visible at night from nearby roads and the primary visitor use areas including the Visitor Center, Mammoth Cave Hotel, and Headquarters Campground. Views from most locations of a 280 foot tower at this location would be obstructed by the dense forest vegetation.

Both the computer modeling and the balloon test indicate that a tower at a height of 185 feet above ground level at the Hickory Cabin Fire Tower Site would not be visible from view points within the park during the summer months. It also would not be visible during the winter months when most

trees do not have leaves with the following exception. People driving along the Green River Ferry Road when in close proximity (less than .25 miles) to the Hickory Cabin Fire Tower site during the winter season might catch brief glimpses of the structure through the trees if they know where to look. When there was a fire tower at the Hickory Cabin site it was not visible through the trees. The balloon test did demonstrate that the tower would not be visible from view points within the park except from within the clearing at the Hickory Cabin Fire Tower site.

The balloon was barely visible from a few view points on the high ridge along 1827 east of the Forks Store, which is located at the intersection of Route 1827 and Route 1352. At these locations there is no vegetation to obstruct the view. These locations are well outside the park, at a minimum distance of two miles from the Hickory Cabin Fire Tower site.

Following are photographs of the balloon test on September 15, 2004, viewshed maps, and the line of sight profiles.

Preparing the balloon for tethering

Looking toward the Hickory Cabin Fire Tower site from Good Spring Church

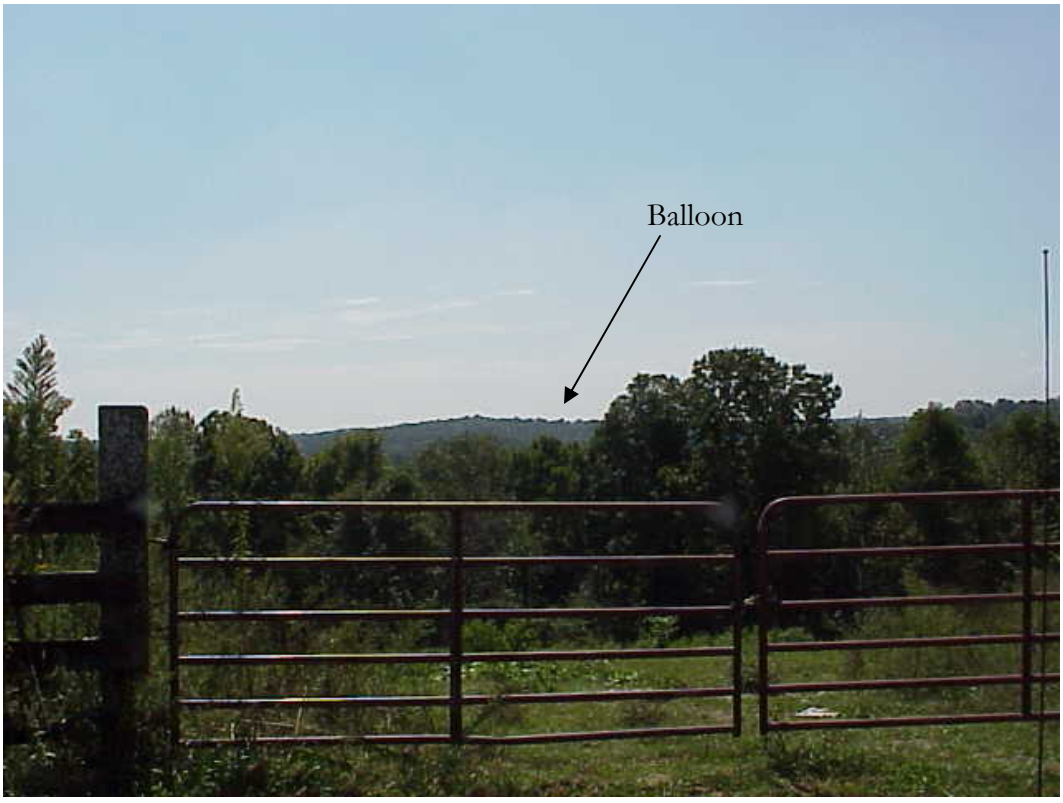
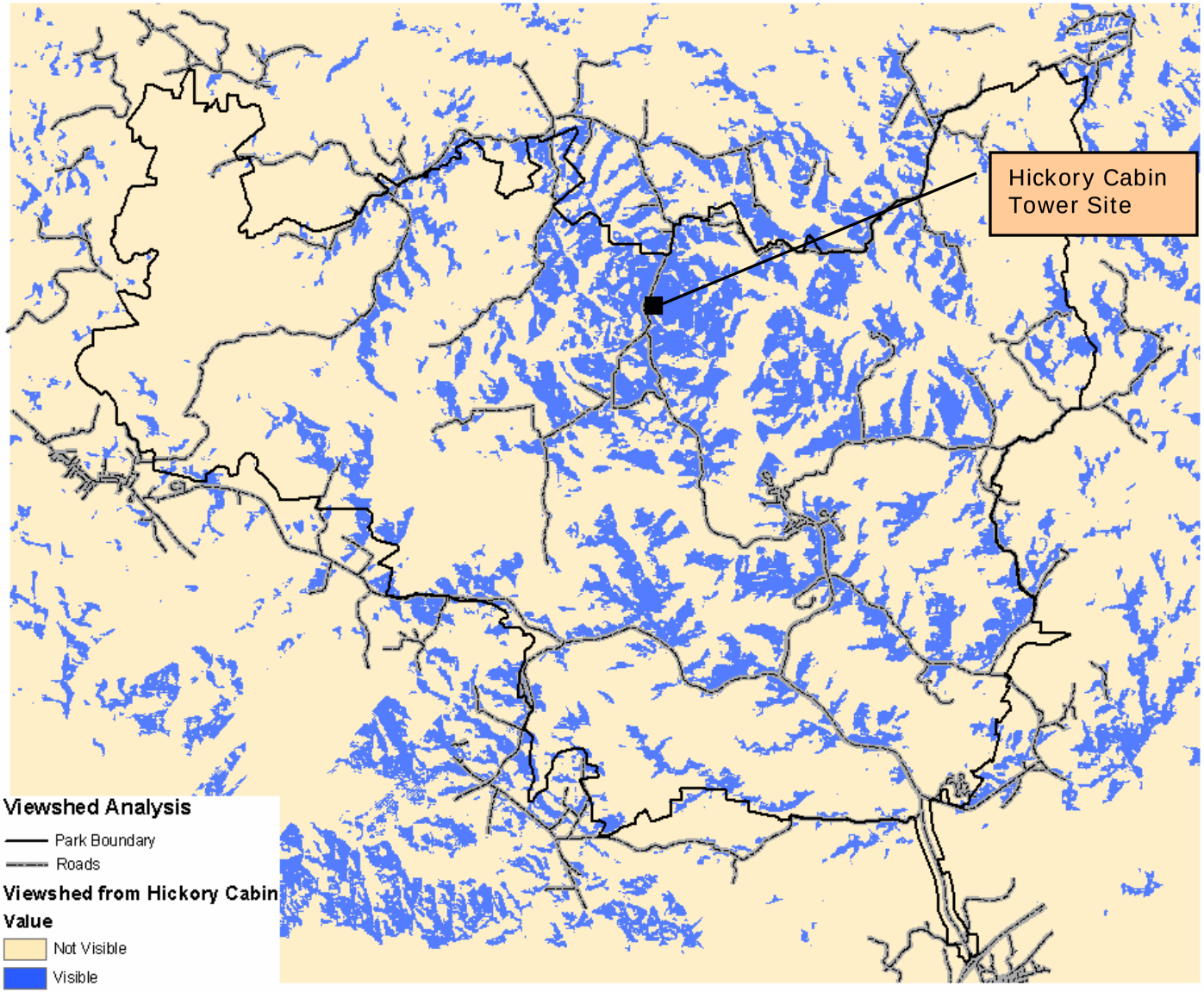
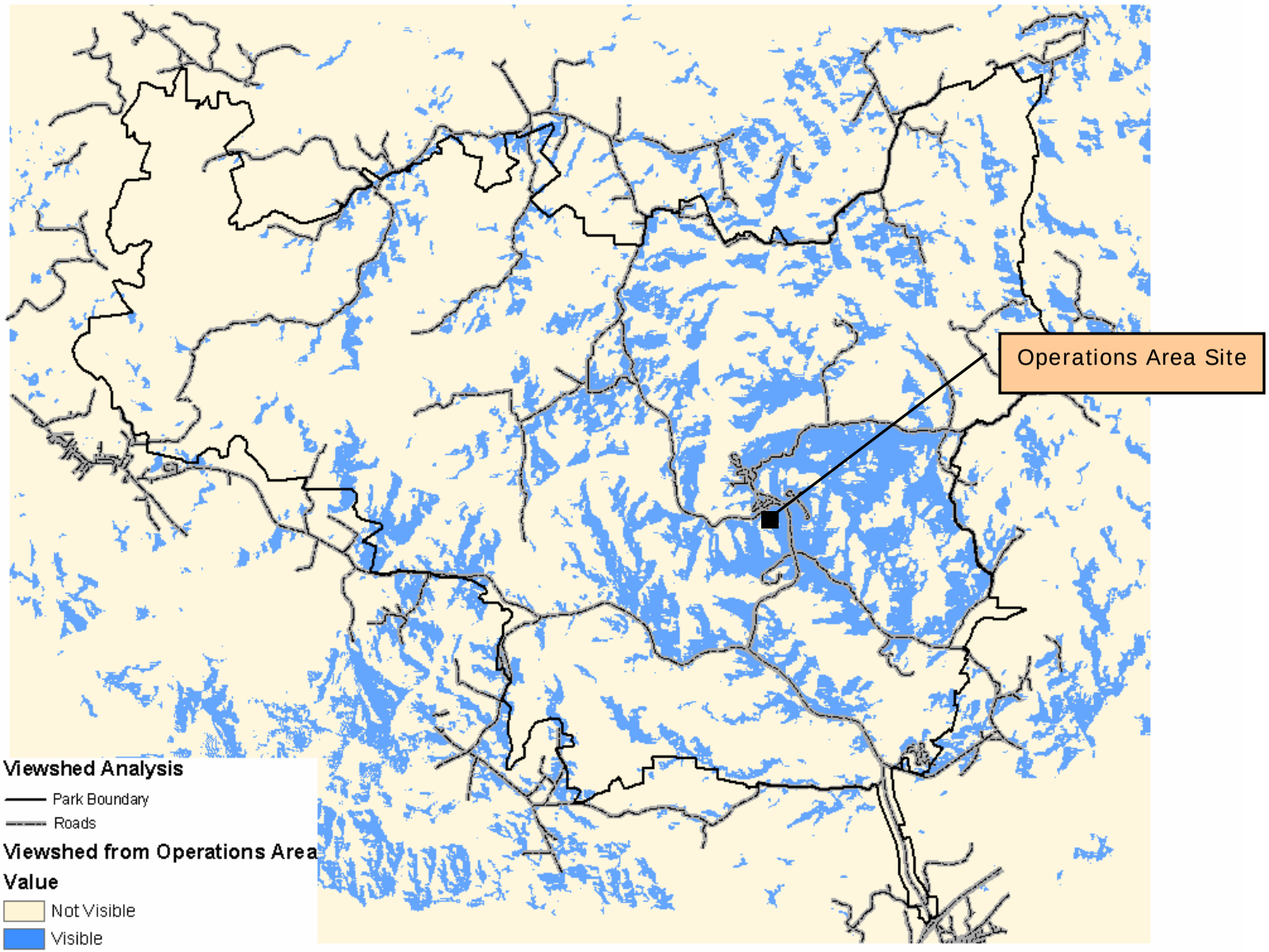
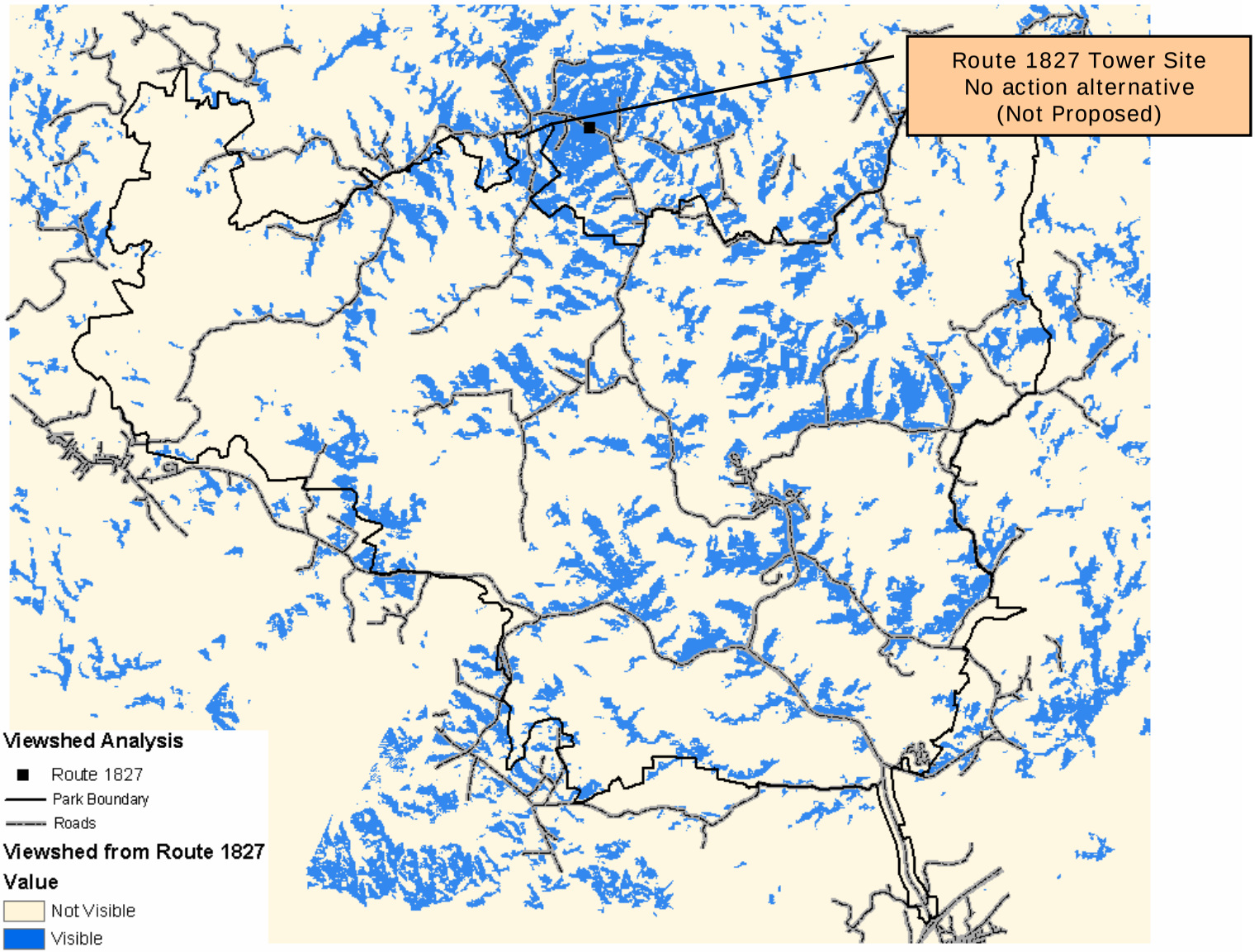


Photo of balloon from Route 1827 without magnification

Photo of balloon from same location with approximately 14X magnification

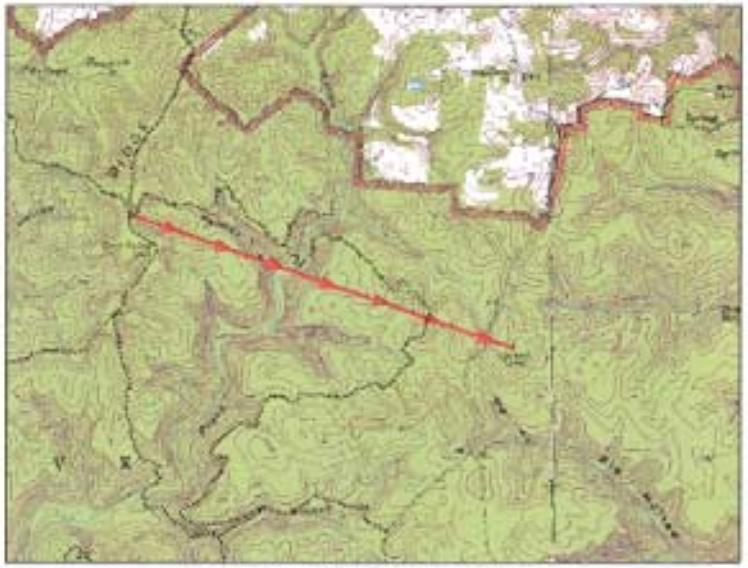

Hickory Cabin
Tower Site
Viewshed Analysis
Park Boundary
Roads
Viewshed from Hickory Cabin
Value
Not Visible
Visible


Operations Area Site
Viewshed Analysis
Park Boundary
Roads
Viewshed from Operations Area
Value
Not Visible
Visible

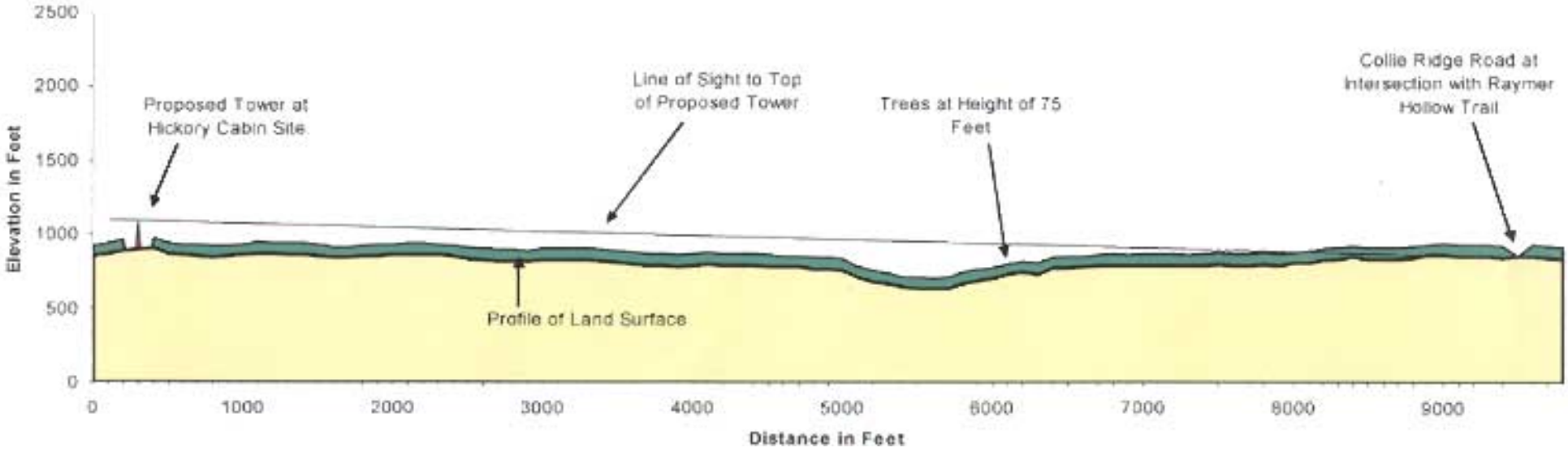

Route 1827 Tower Site
No action alternative
(Not Proposed)
Viewshed Analysis
Route 1827
Park Boundary
Roads
Viewshed from Route 1827
Value
Not Visible
Visible

Viewshed Analysis of Hickory Cabin Tower Site Viewed From the Collie Ridge Road at Intersection with Raymer Hollow Trail

Line of Sight Photo



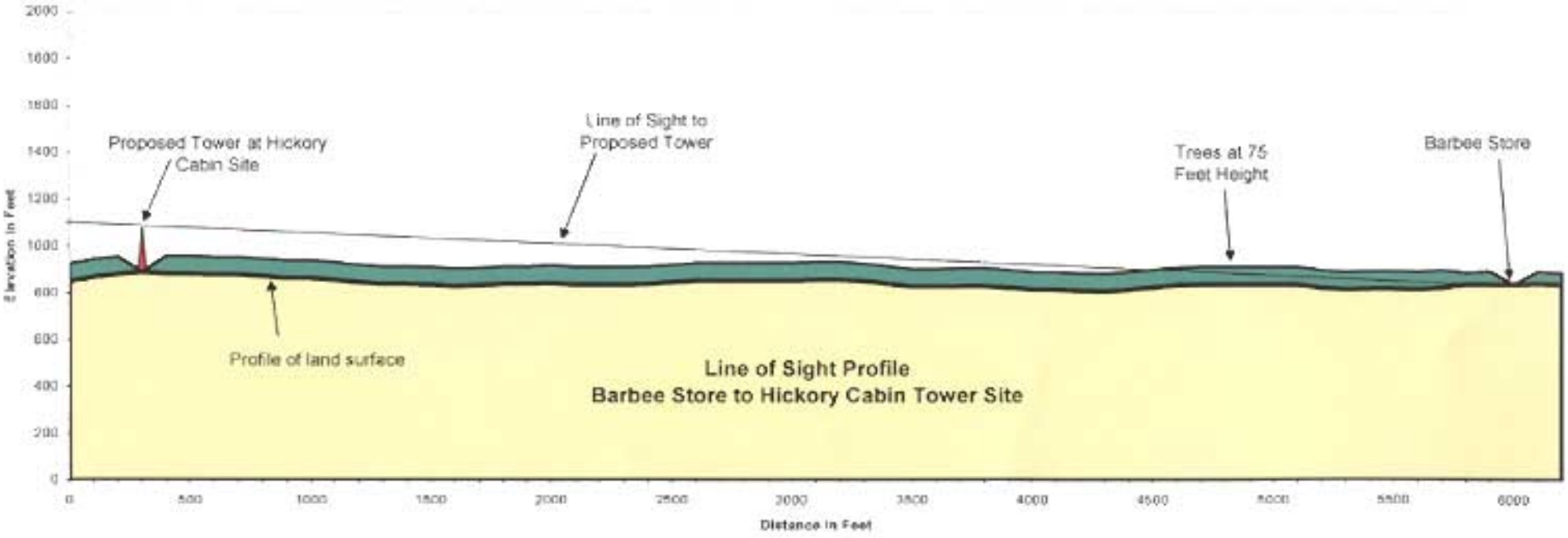
Line of Sight Map



Viewshed Analysis of Hickory Cabin Tower Site Viewed From the Barbee Store Location

Line of Sight Photo

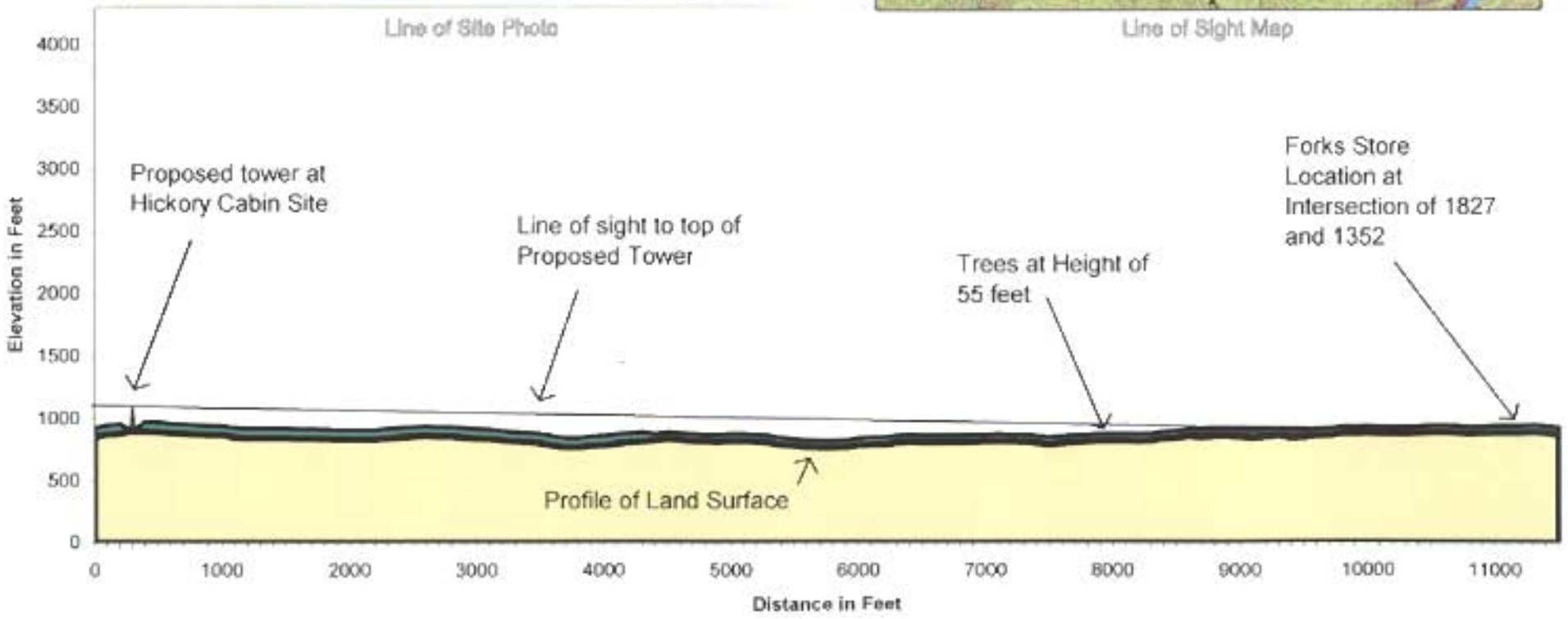
Line of Sight Map



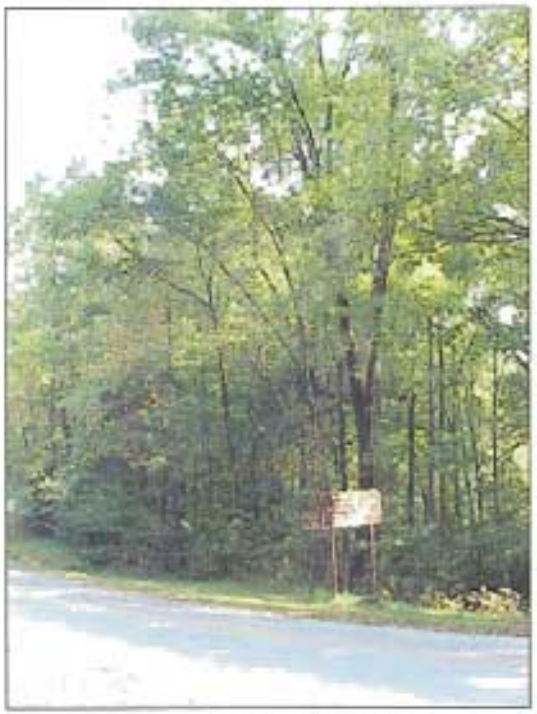
Viewshed Analysis of Hickory Cabin Tower Site Viewed From Forks Store

Line of Site Photo

Line of Sight Map

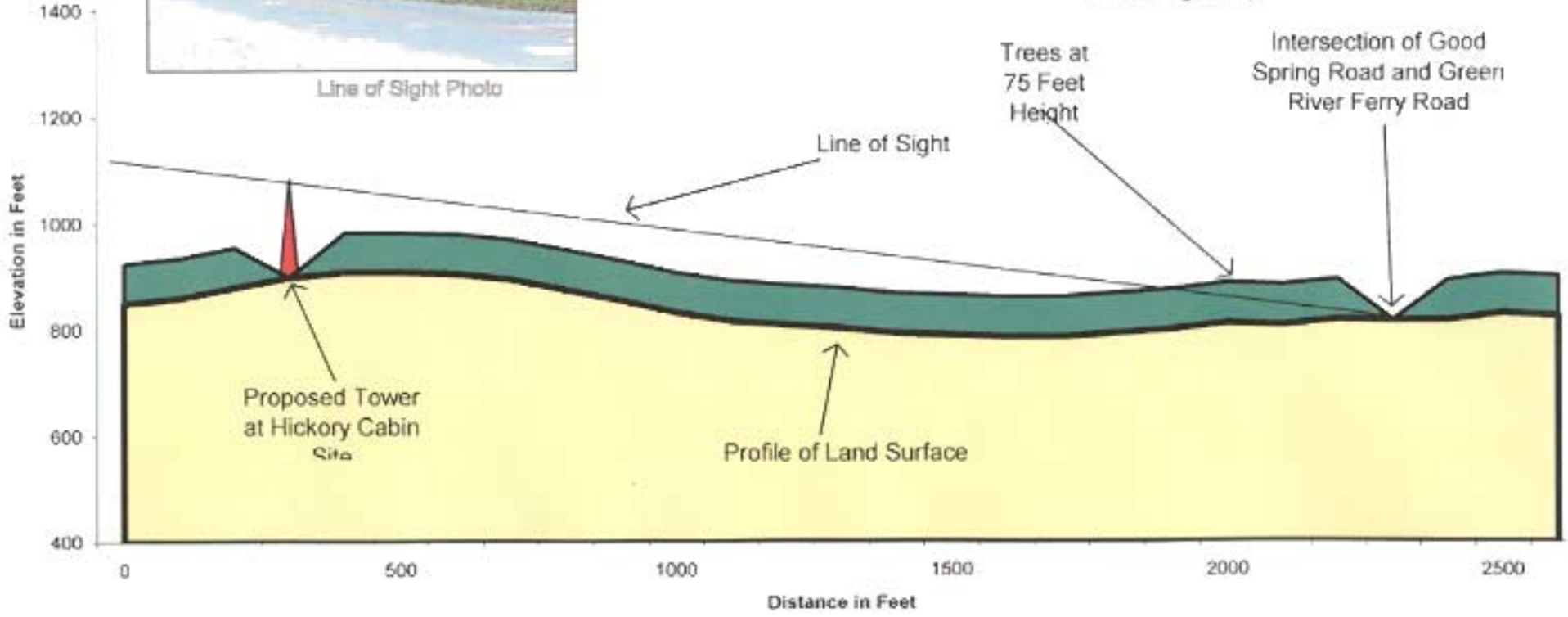


Viewshed Analysis of Hickory Cabin Tower Site Viewed From Green River Ferry Road at Good Spring Road Intersection



Line of Sight Photo

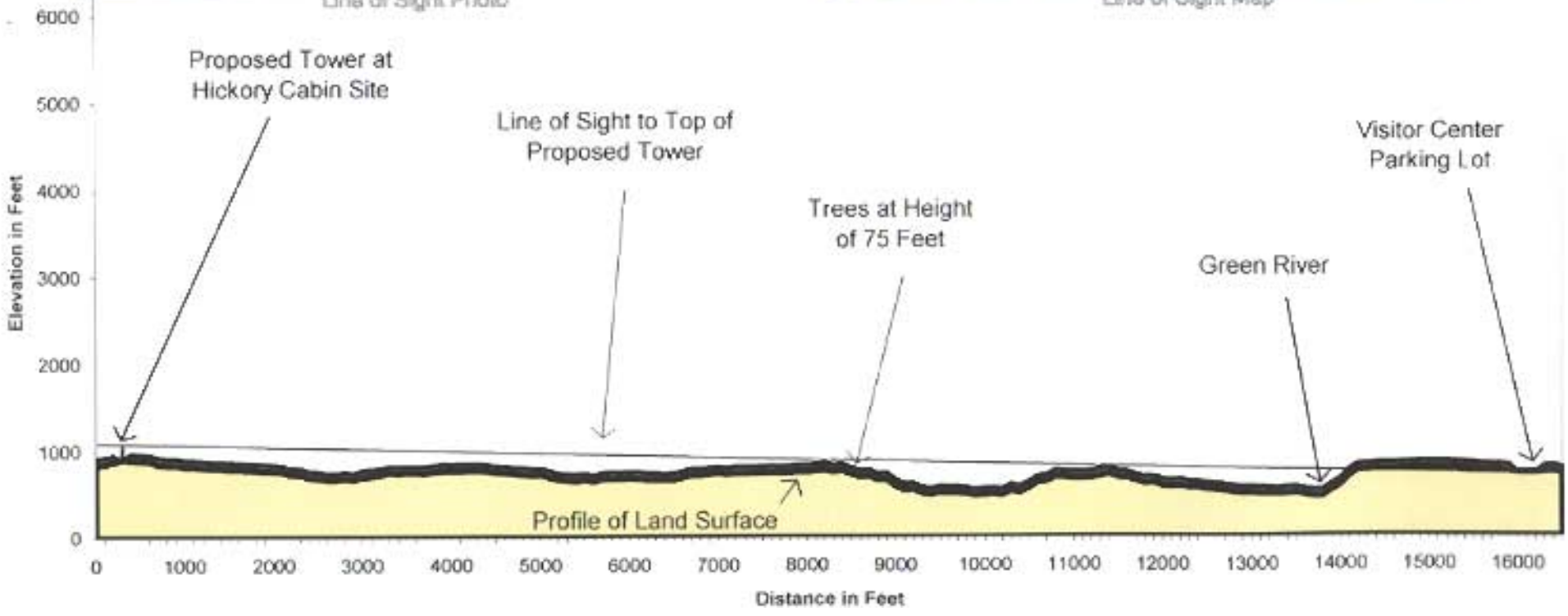
Line of Sight Map



Viewshed Analysis of Hickory Cabin Tower Site Viewed From the Visitor Center Parking Lot

Line of Sight Photo

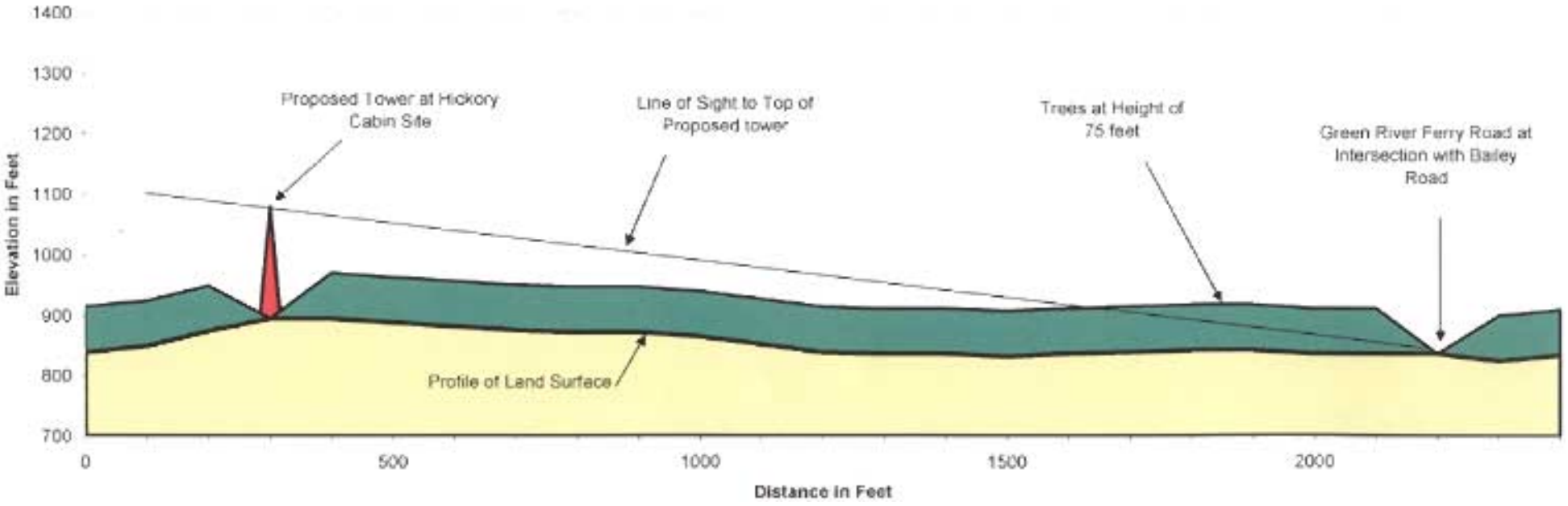
Line of Sight Map



Viewshed Analysis of Hickory Cabin Tower Site Viewed From the Green River Ferry Road at Intersection with Bailey Road

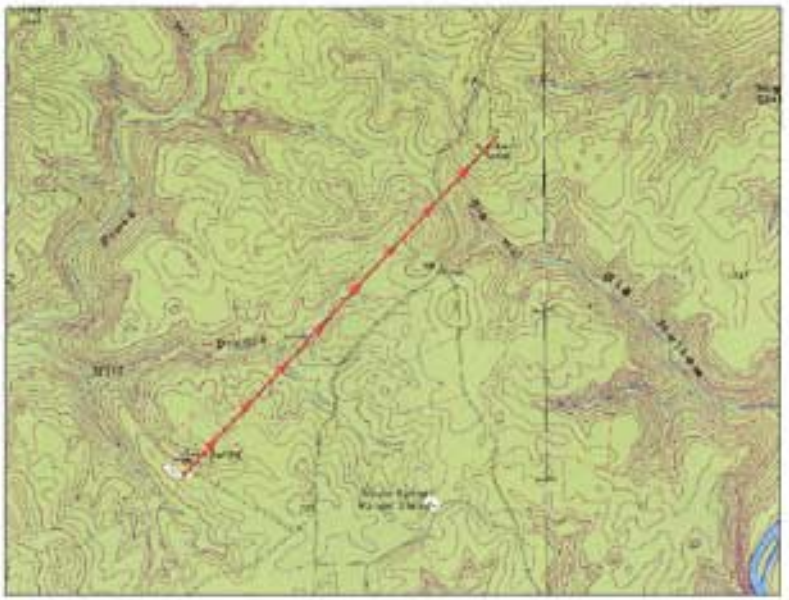
Line of Sight Photo

Line of Sight Map

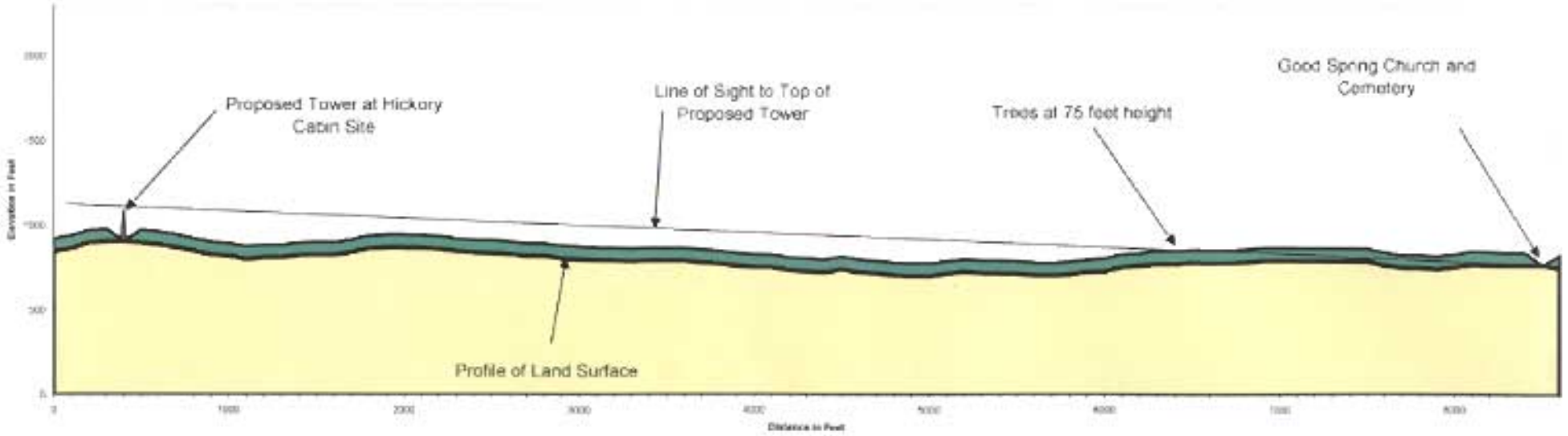


Viewshed Analysis of Hickory Cabin Tower Site Viewed From Good Spring Church

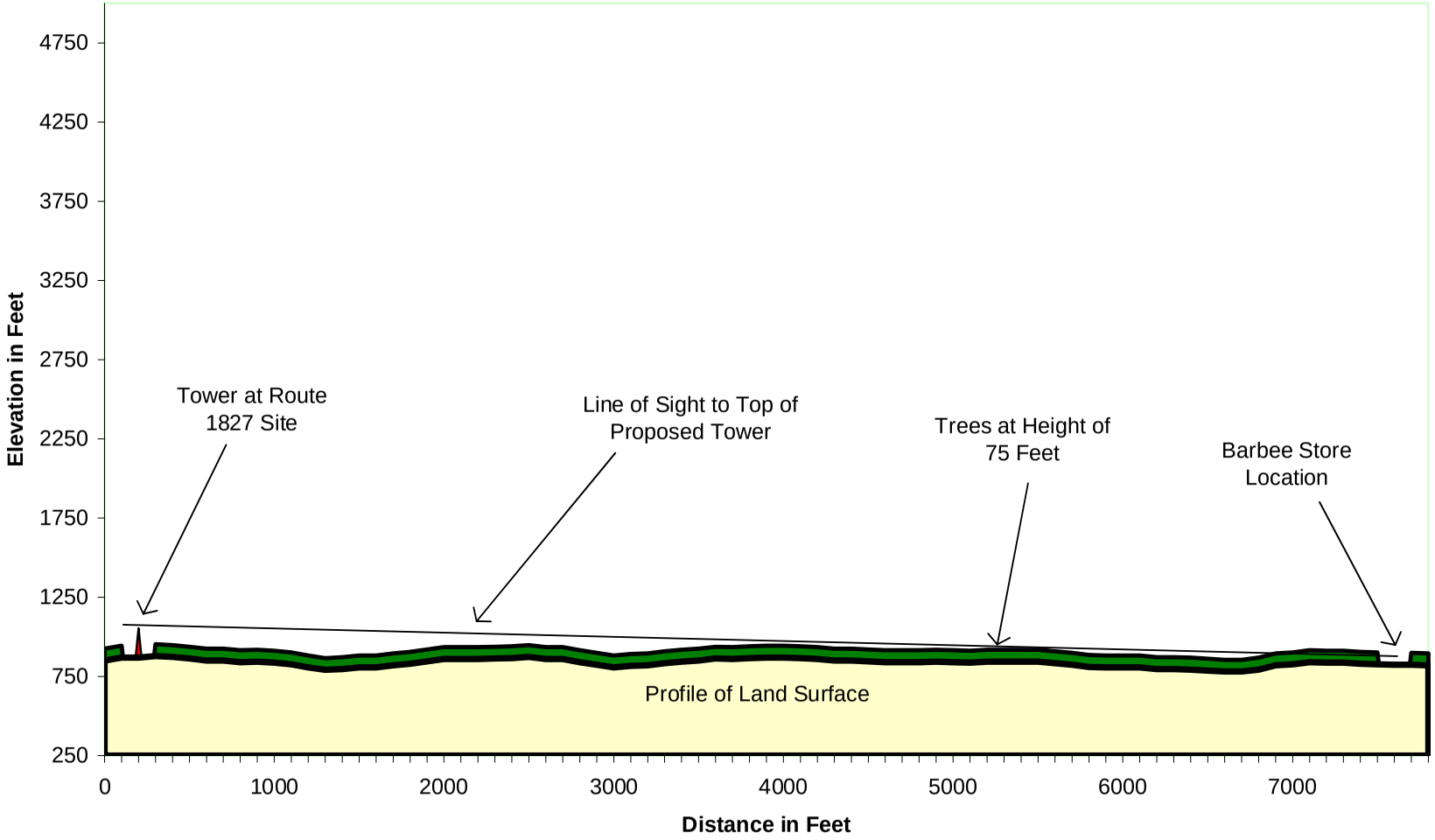
Line of Sight Photo



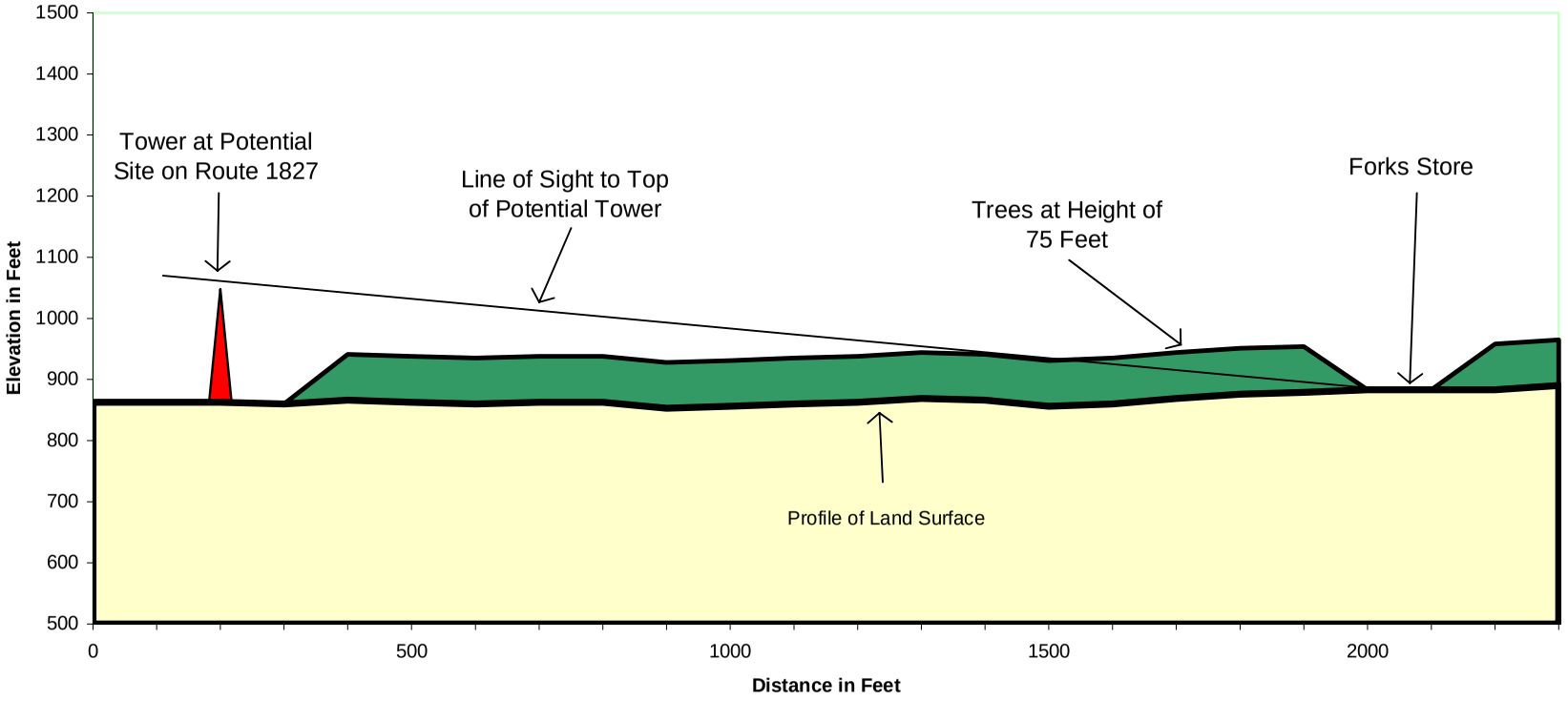
Line of Sight Map



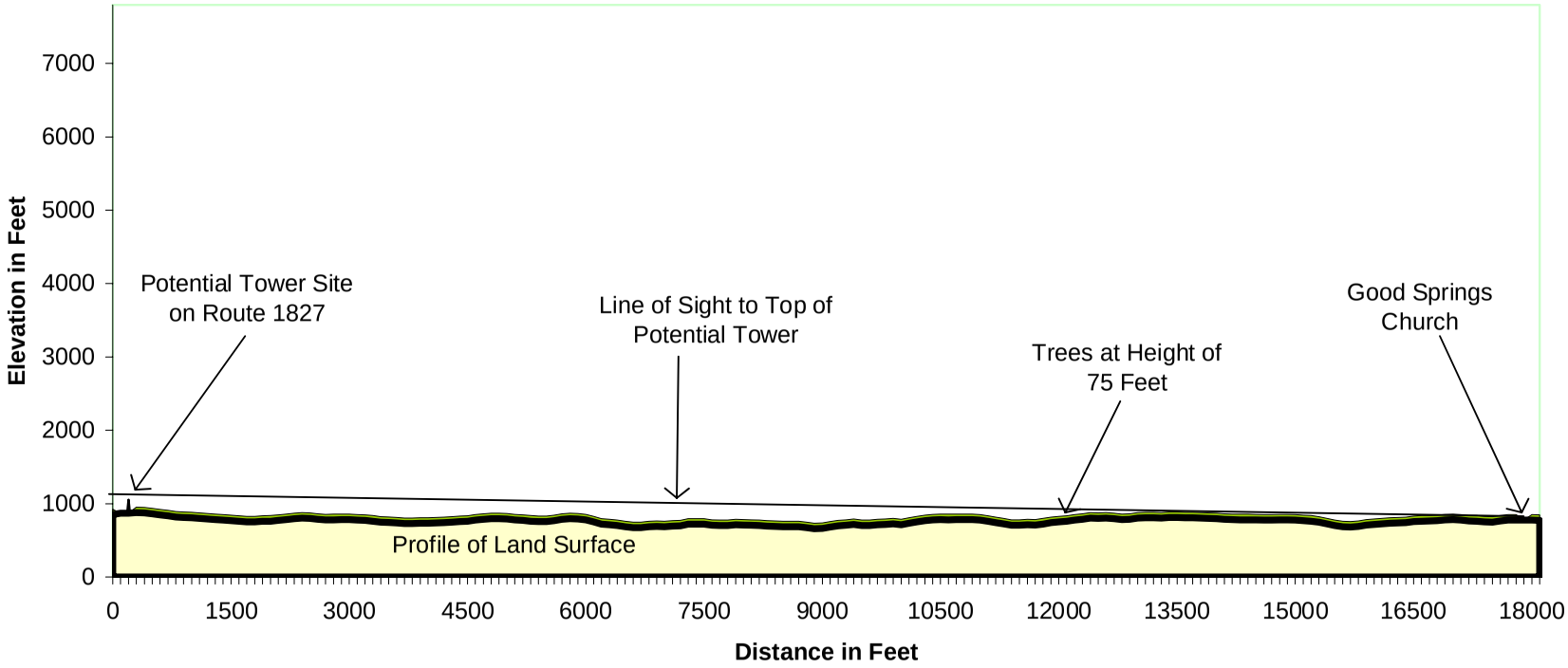
Line of Sight Profile
Barbee Store to Potential Route 1827 Tower Site



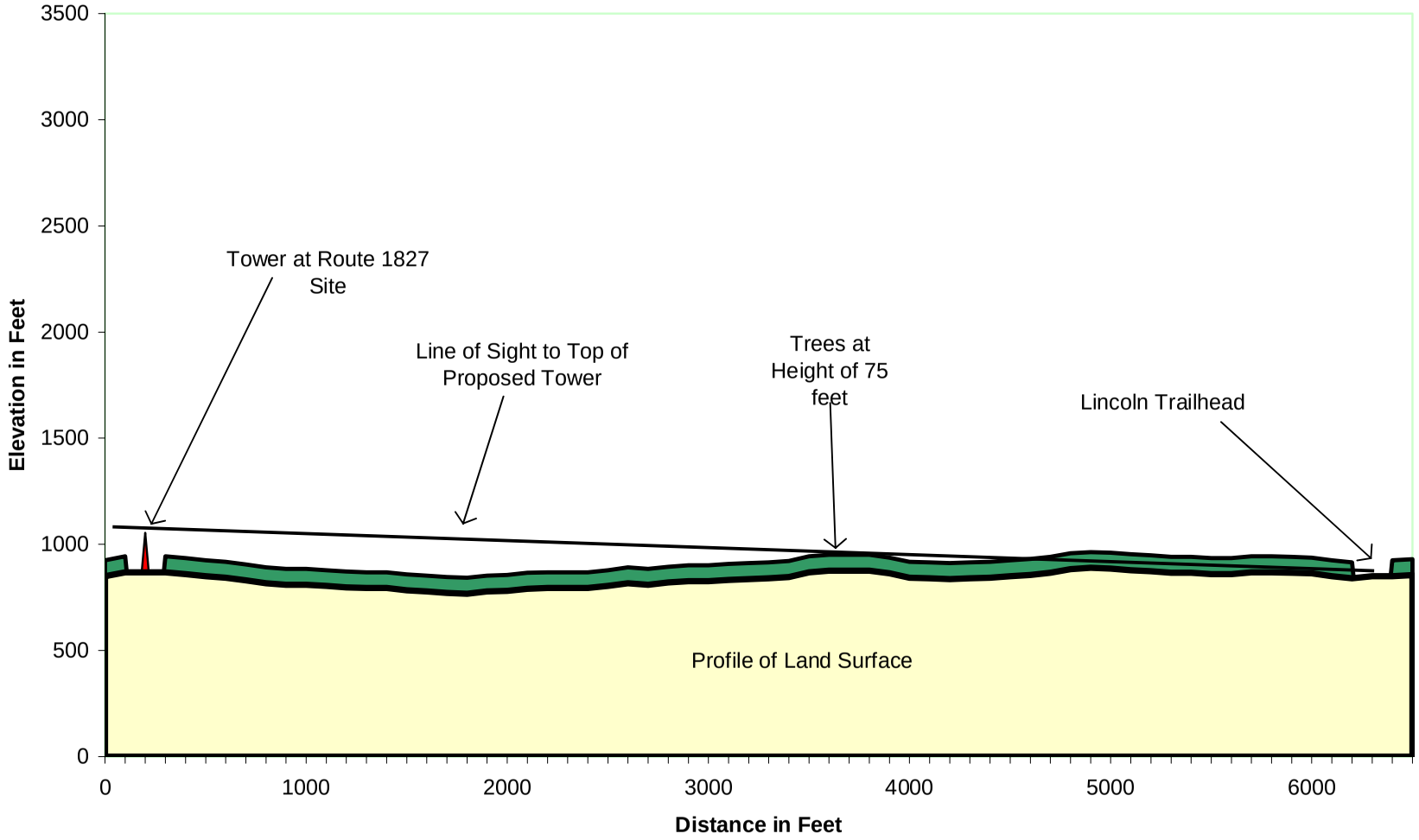
Line of Sight Profile
Forks Store to Potential Route 1827 Tower Site



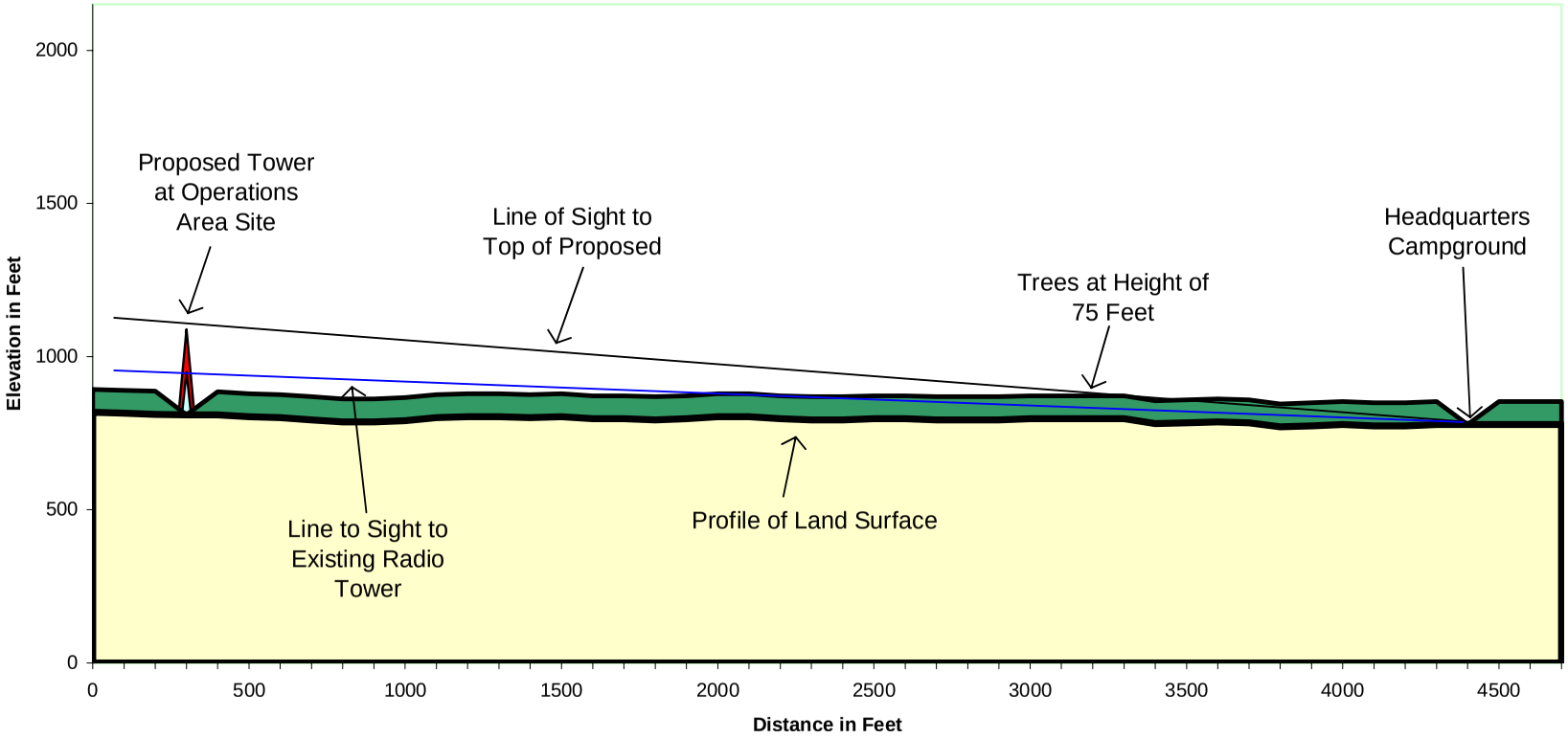
Line of Sight Profile
Good Spring Church to Potential Route 1827 Tower Site



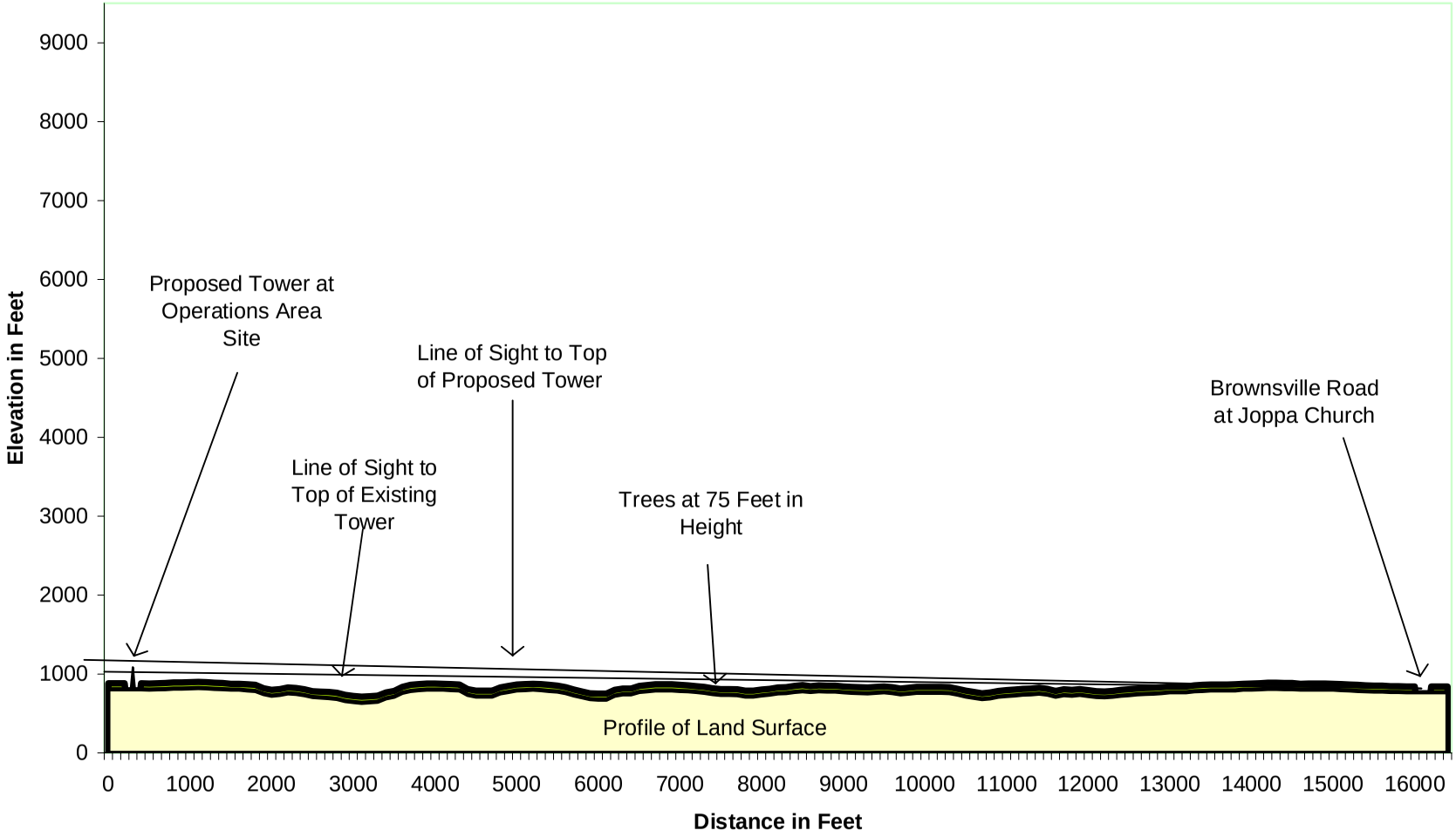
Line of Sight Profile
Lincoln Trailhead to Potential Route 1827 Tower Site



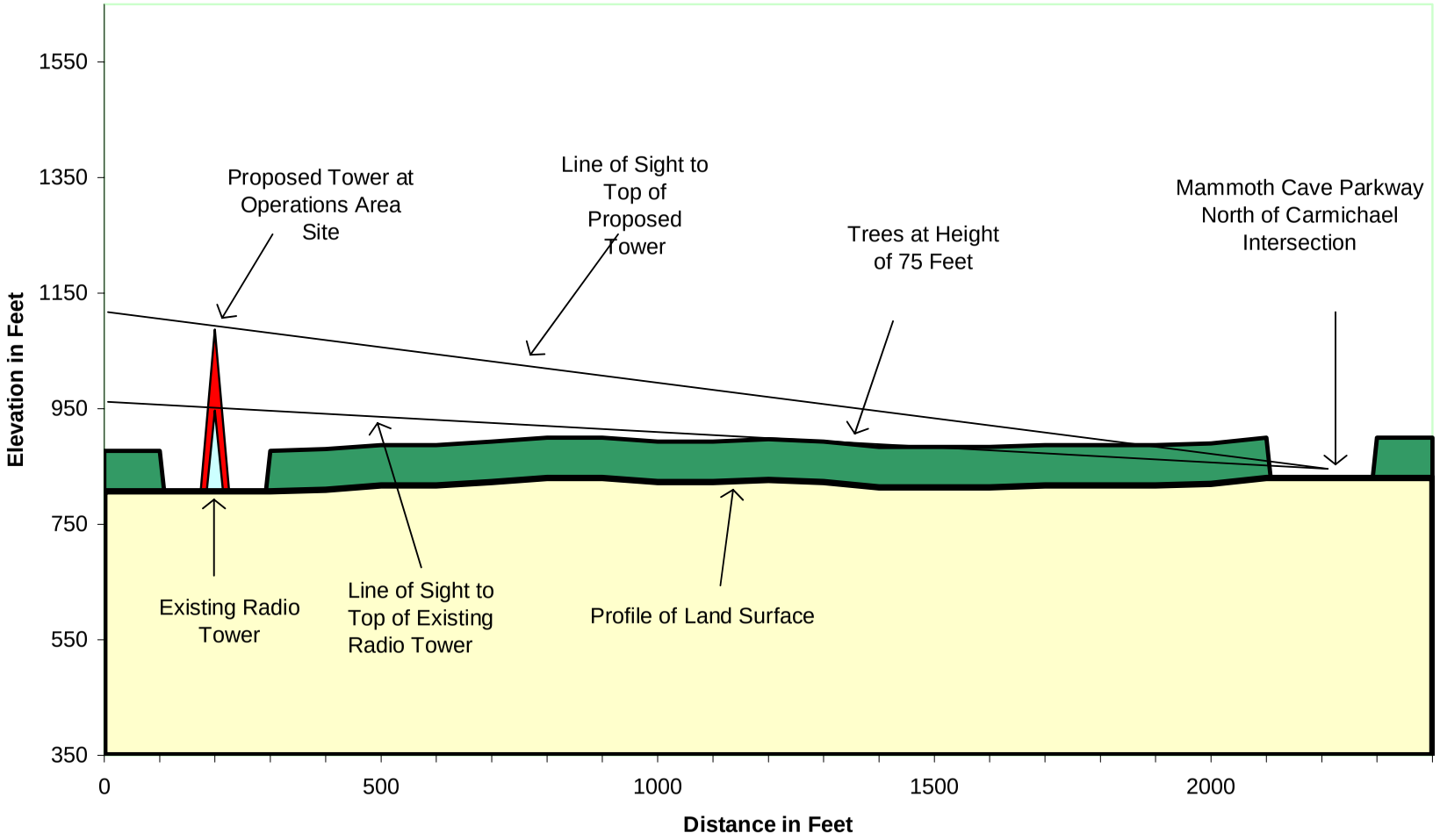
Line of Sight Profile
Headquarters Campground to Operations Area Tower Site



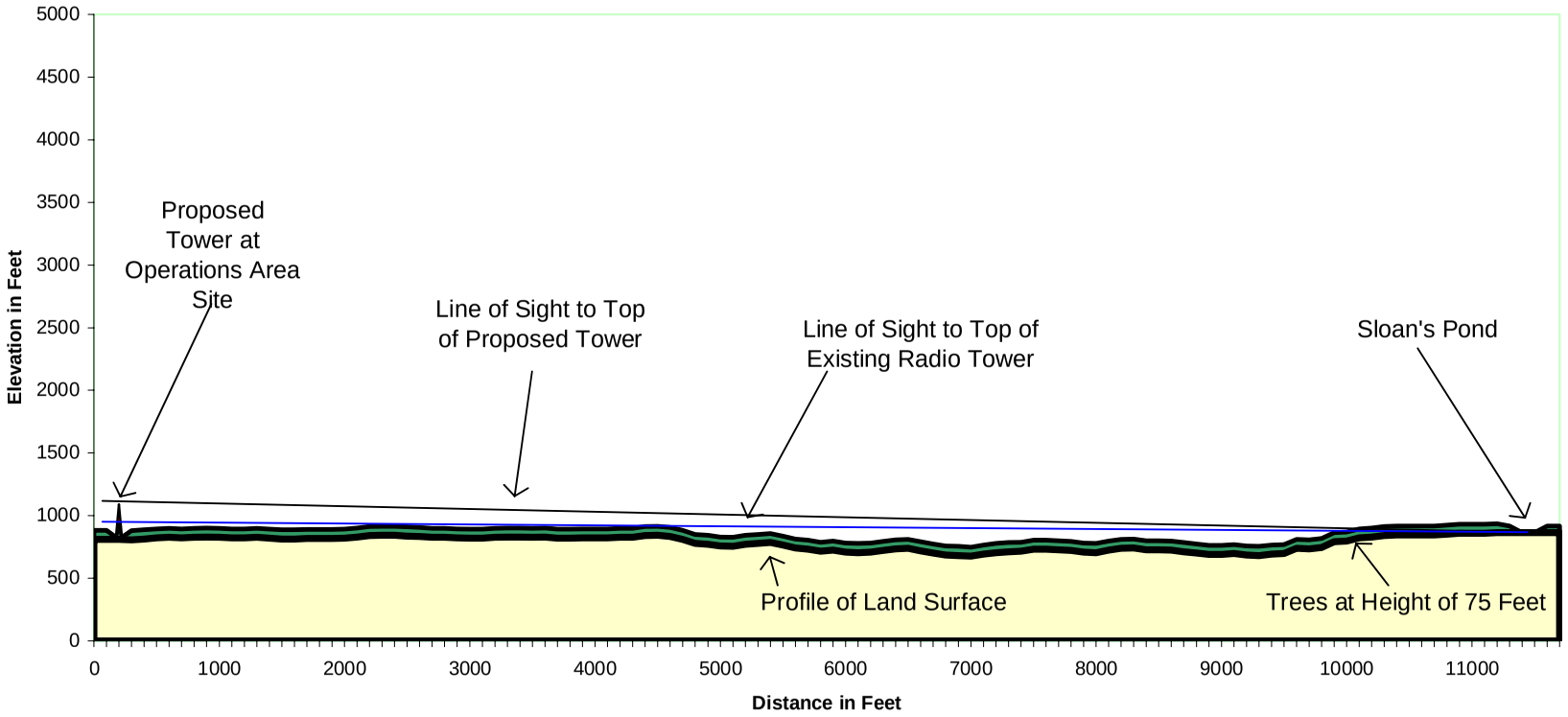
Line of Sight Profile
Joppa Church to Operations Area Tower Site



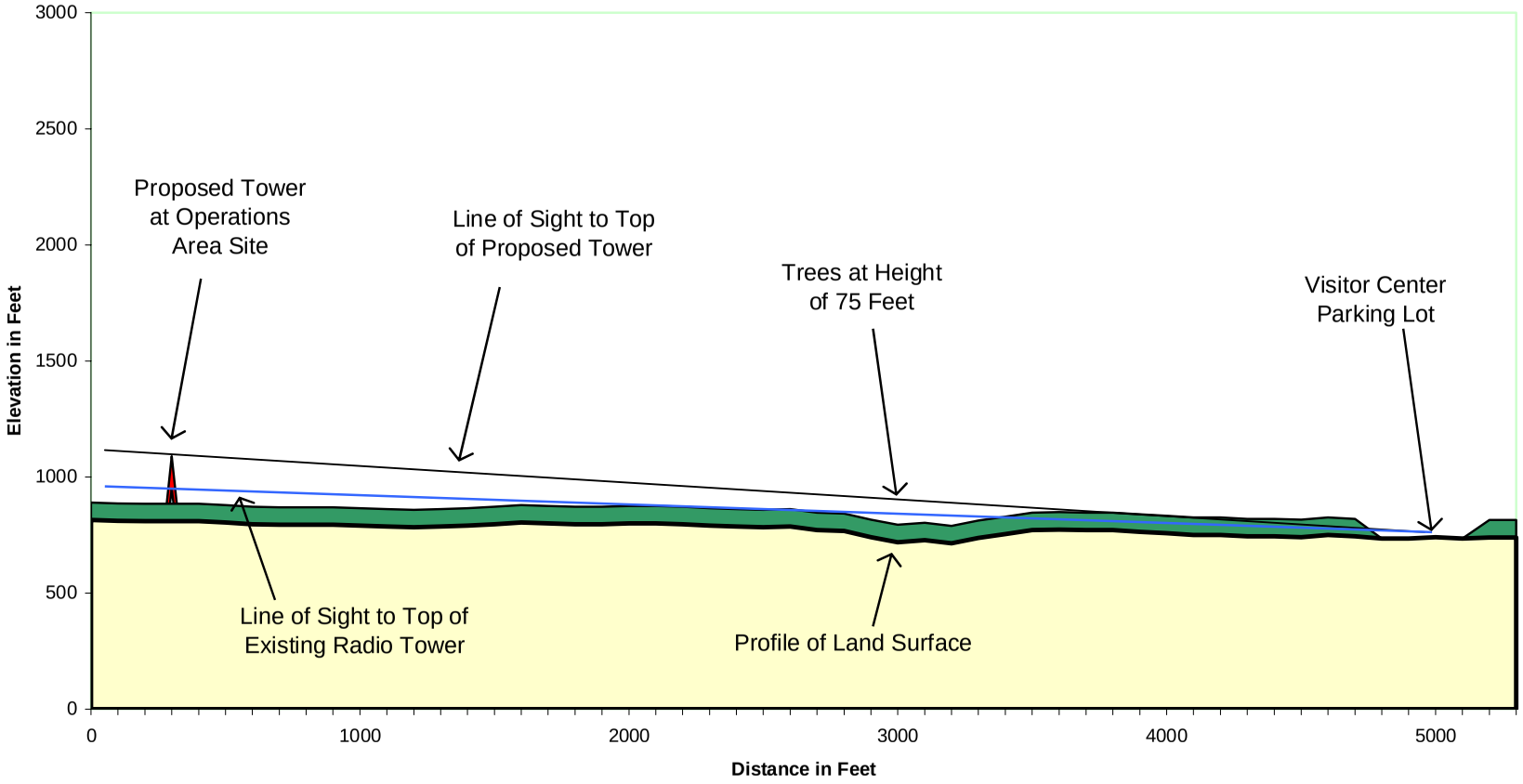
Line of Sight Profile
Mammoth Cave Parkway at Carmichael Intersection to Operations Area Tower Site



Line of Sight Profile
Sloan's Pond and Operations Area Tower Site



Line of Sight Profile
Visitor Center Parking Lot to Operations Area Site



Attachment 2: Copy of February 19, 2004 letter from Bluegrass Cellular including copy of Cellular License to Kentucky RSA #3 Cellular General Partnership

BLUEGRASS CELLULAR

IT'S SO EASY.

February 19, 2004

United States Department of the Interior
National Park Service
Mammoth Cave National Park
Attn: Mr. Henry T. Holman
P.O. Box 7
Mammoth Cave, Kentucky 42259-0007

Mr. Holman:

Bluegrass Cellular proposes to construct a communications facility to improve mobile communications coverage in an area located within Mammoth Cave National Park located near the town of Ollie, Kentucky. The project as proposed involves the construction of a180 foot tall, self support tower. Antennas and coaxial lines will be placed on the tower for communication purposes. Antennas will be a directional type panel and coaxial transmission lines will be 1 5/8" in diameter. We are estimating a total of nine (9) antennas and coaxial transmission lines. The placement of associated telecommunication equipment will be housed in a prefabricated building to be located at the base of the tower. The prefabricated building will require 200 amp single phase electrical source and telephone land service from the local utility companies. A generator for the purpose of back up power will also be placed within the compound as well. The compound is to be gravel-covered surrounded by a wooden fence. Access to the site will be an existing gravel road.

Please feel free to call if I can be of further assistance.

Respectfully,

Allen McGinsey
Network Project Manager
Bluegrass Cellular
270-766-3909

Cc: Scott McCloud
Vice President Wireless Networks

ULS License

Cellular License - KNKN867 - Kentucky RSA #3 Cellular General Partnership

Call Sign	KNKN867	Radio Service	CL - Cellular
Status	Active	Auth Type	Regular

Market

Market	CMA445 - Kentucky 3 - Meade	Channel Block	B
Submarket	0	Phase	2

Dates

Grant	09/06/2000	Expiration	10/01/2010
Effective	12/12/2003	Cancellation	

Five Year Buildout Date

05/15/1996

Control Points

1	216 W LINCOLN TRAIL, RADCLIFF, KY

Licensee

Licensee ID	L00127332	FRN	0001786706	Type	Partnership
SGIN	000				

Licensee

Kentucky RSA #3 Cellular General Partnership PO Box 5012 ELIZABETHTOWN, KY 42702-5012	P:(270)769-0339 F:(270)769-0745

Contact

Lukas, Nace, Gutierrez & Sachs, Chartered PAMELA L GIST 1111 19th Street NW, Suite 1200 WASHINGTON, DC 20036	P:(202)828-9473 F:(202)828-8408 E:pgist@fcclaw.com

Qualifications, Ownership, and Demographics

Radio Service Type	Mobile		
Regulatory Status	Common Carrier	Interconnected?	Yes
Alien Ownership The Applicant answered "No" to each of the Alien Ownership questions.			
Basic Qualifications The Applicant answered "No" to each of the Basic Qualification questions.			
Race			
Hispanic/Latino?		Gender	

CLOSE WINDOW

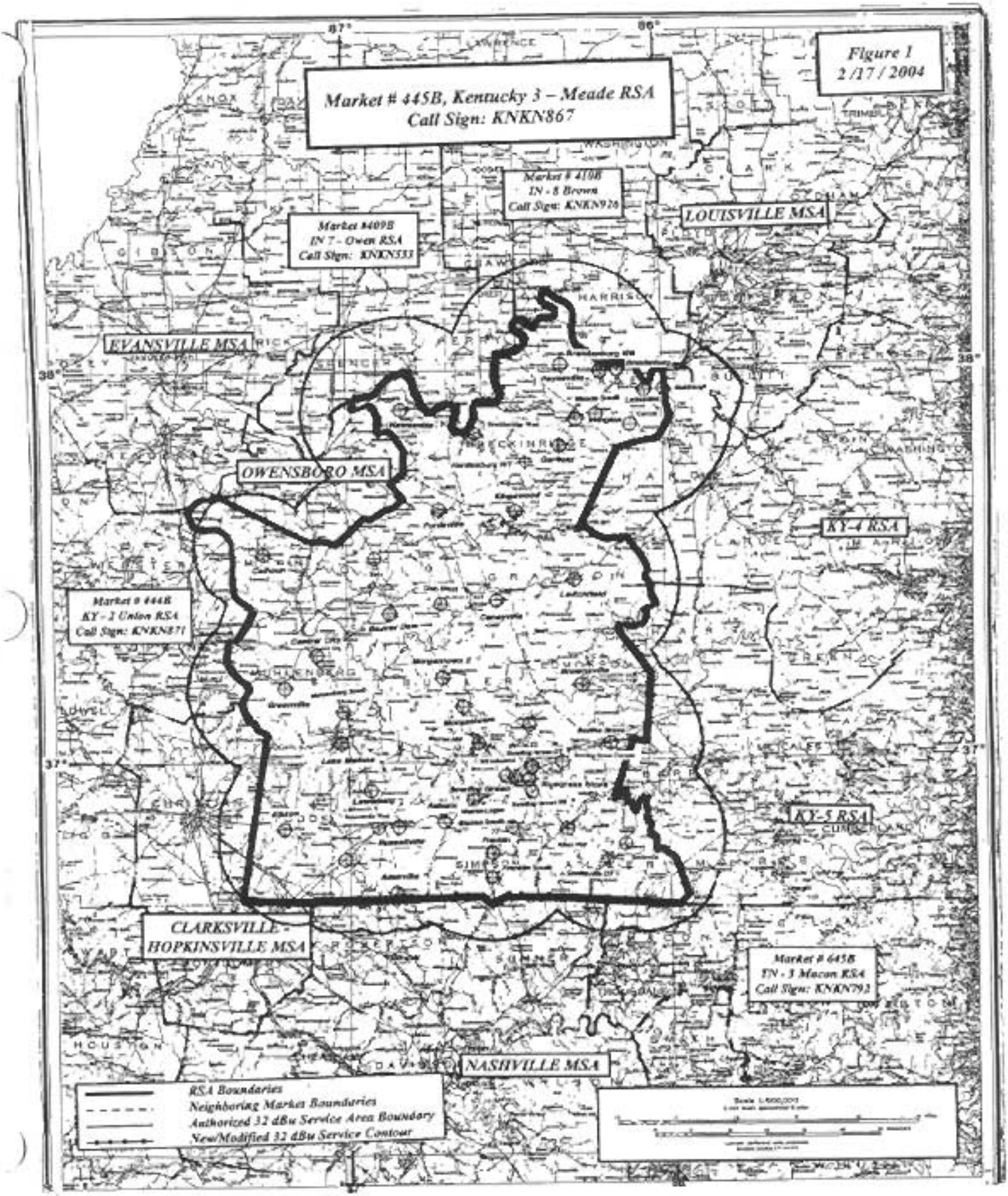


Figure 1
2/17/2004
Market # 445B, Kentucky 3 – Meade RSA
Call Sign: KNKN867
Market # 410B
IN - 8 Brown
Call Sign: KNKN926
Market #409B
IN 7 - Owen RSA
Call Sign: KNKN533
LOUISVILLE MSA
EVANSVILLE MSA
OWENSBORO MSA
KY-4 RSA
Market # 444B
KY - 2 Union RSA
Call Sign: KNKN871
KY-5 RSA
CLARKSVILLE - HOPKINSVILLE MSA
Market # 645B
TN - 3 Macon RSA
Call Sign: KNKN793
NASHVILLE MSA
RSA Boundaries
Neighboring Market Boundaries
Authorized 32 dBu Service Area Boundary
New/Modified 32 dBu Service Contour

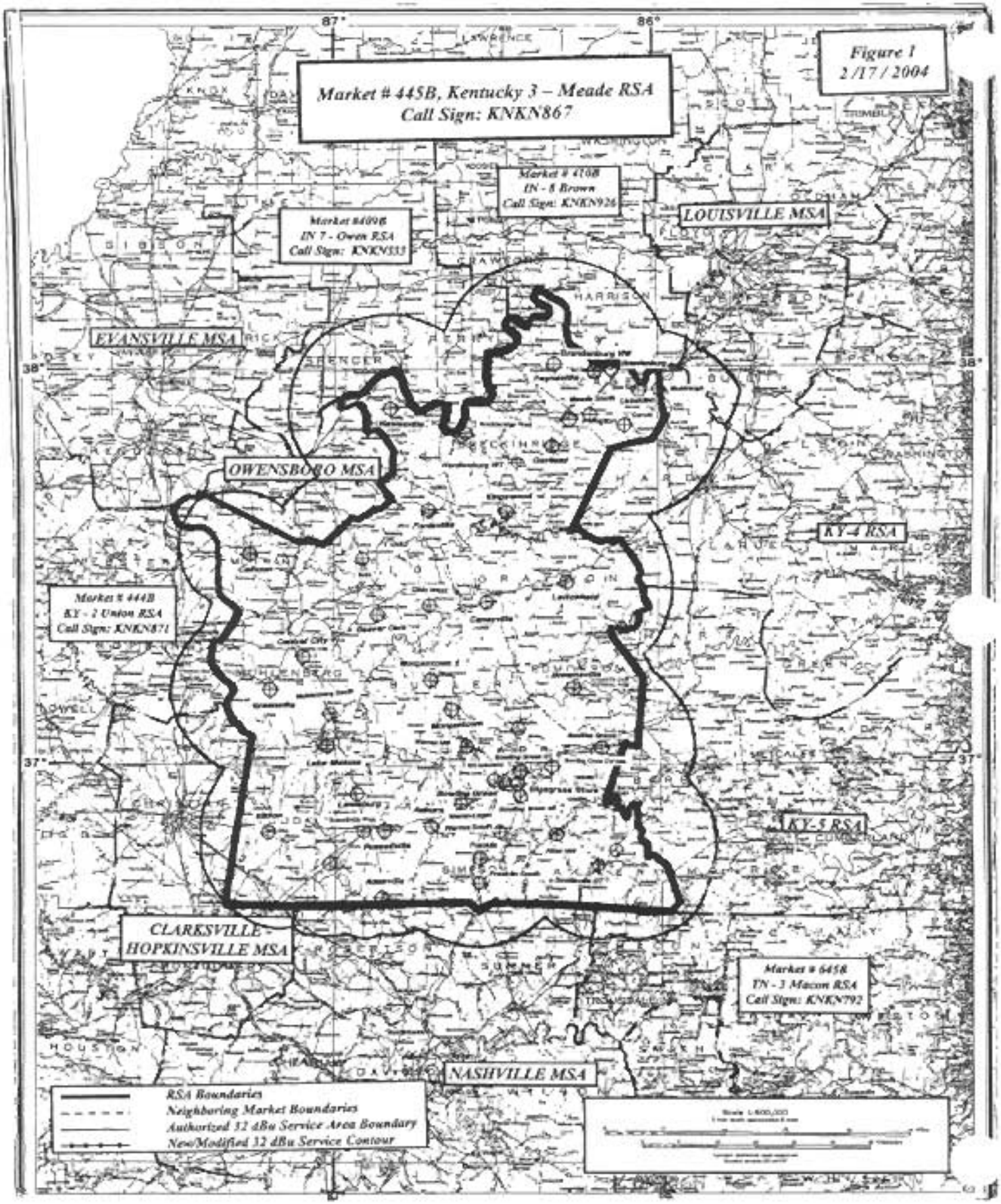


Figure 1
2/17/2004
Market # 445B, Kentucky 3 – Meade RSA
Call Sign: KNKN867
Market # 4108
IN - 8 Brown
Call Sign: KNKN926
Market #409B
IN 7 - Owen RSA
Call Sign: KNKN533
LOUISVILLE MSA
EVANSVILLE MSA
OWENSBORO MSA
KY-4 RSA
Market # 444B
KY - 2 Union RSA
Call Sign: KNKN871
KY-5 RSA
CLARKSVILLE-
HOPKINSVILLE MSA
Market # 645B
TN - 3 Macon RSA
Call Sign: KNKN792
NASHVILLE MSA
RSA Boundaries
Neighboring Market Boundaries
Authorized 32 dBu Service Area Boundary
New/Modified 32 dBu Service Contour
87°
86°
38°
37°

Prevention of Radiofrequency Interference

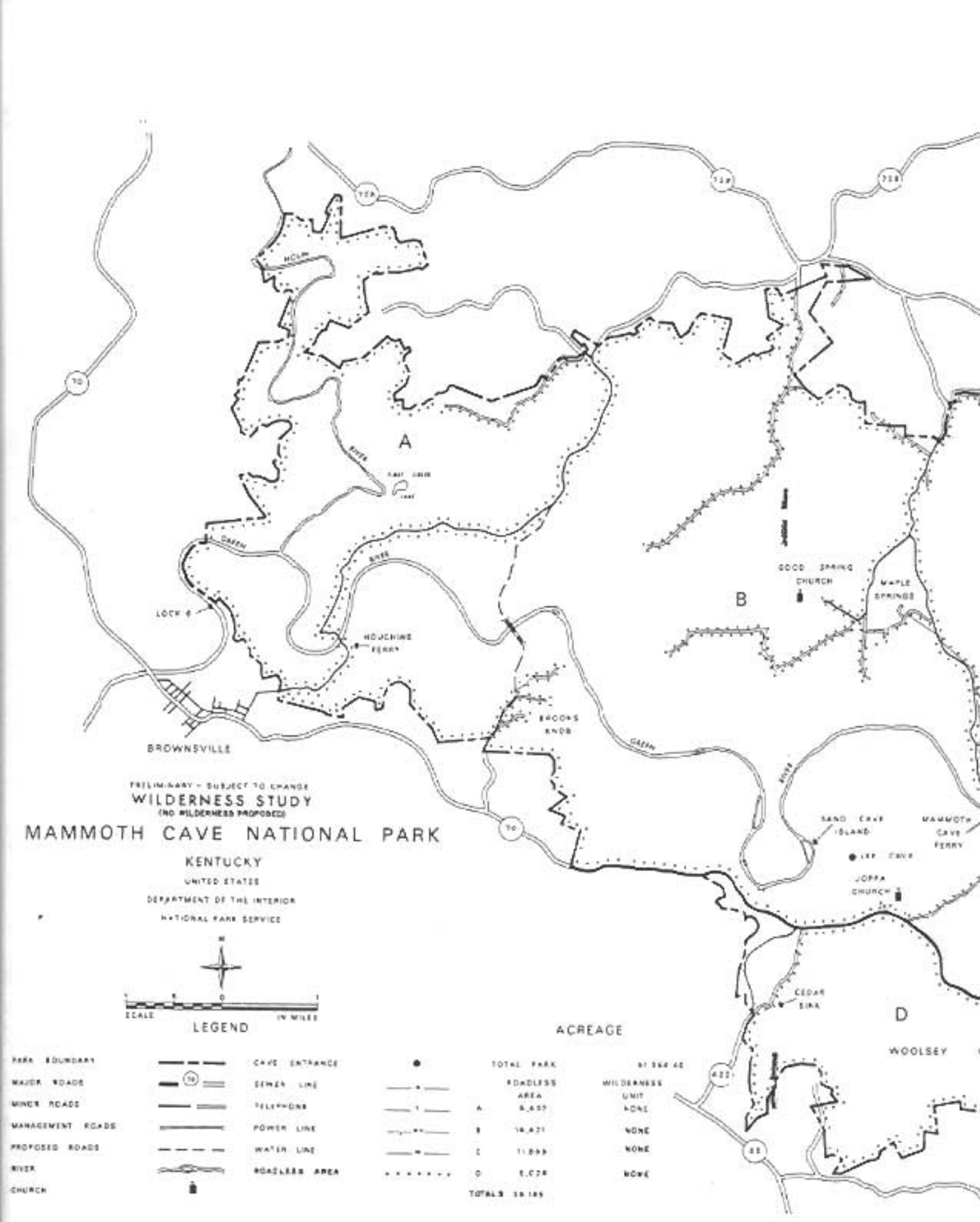
Kentucky RSA #3 Cellular General Partnership d/b/a Bluegrass Cellular ("Bluegrass Cellular") will prevent the proposed WTF site from causing interference with other existing sites operated by the Service or other private parties, either in or adjacent to the park. As an FCC licensee in the Cellular Radiotelephone Service, Bluegrass Cellular employs technology that meets the technical requirements of Part 22 of FCC Rules, 47 CFR Section 22.901 *et seq*. Attached hereto is a copy of Bluegrass Cellular's FCC license for Station KNKN867, authorizing service to Market 445B - Kentucky Rural Service Area 3 – Meade, which includes Edmonson County, Kentucky. Also included is a map showing the boundaries of the authorized service area and the relation ship of that area ti the park's boundaries.

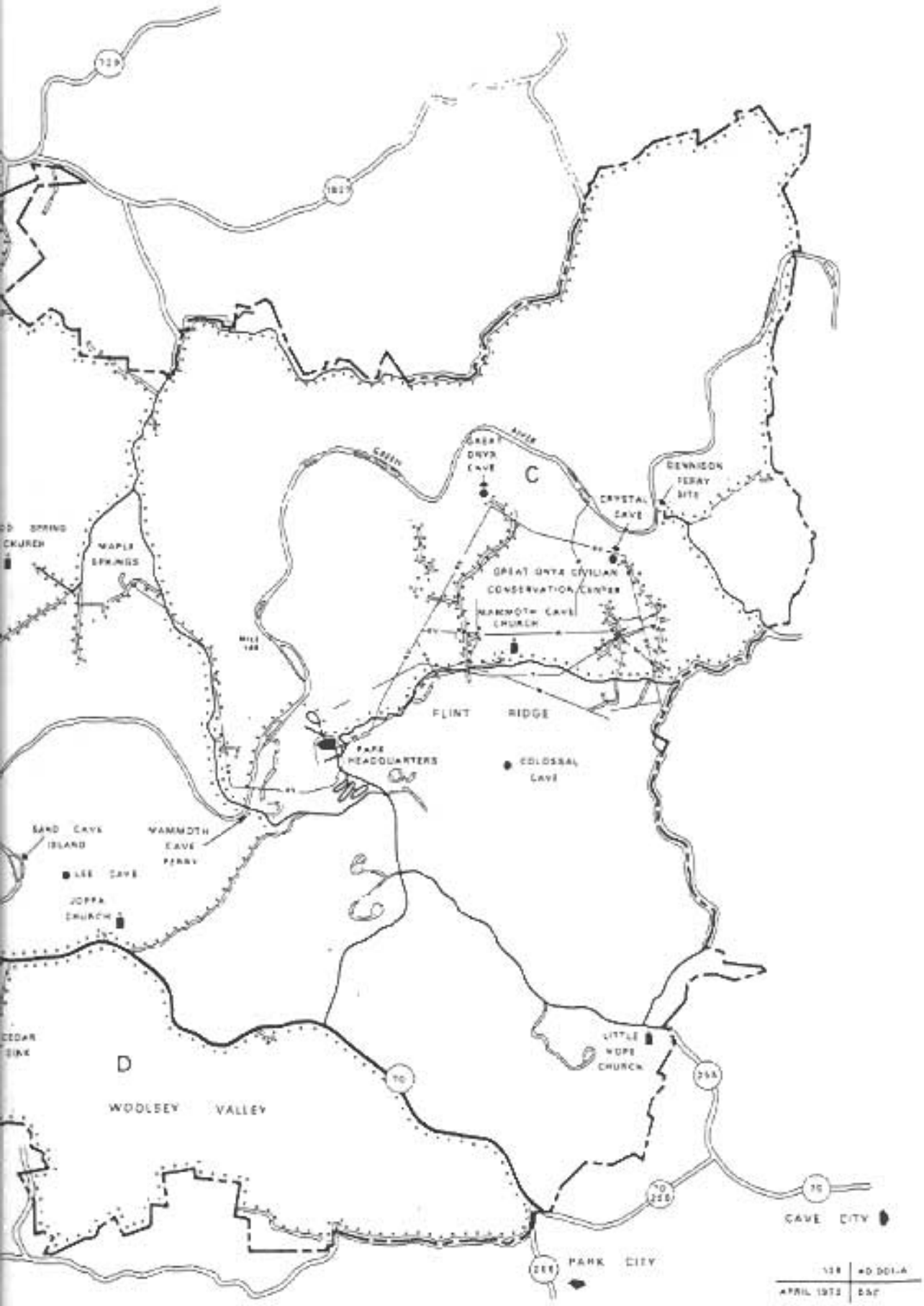
Five Year Build Out

Bluegrass Cellular complies with FCC rules by routinely coordinating channel usage at each of its transmitter locations. Coordination is conducted in the appropriate manner with operators whose transmitters are located within 75 miles of any of transmitter locations operated by Bluegrass Cellular. Bluegrass Cellular cooperates with other operators and makes reasonable efforts to resolve technical problems that may inhibit effective and efficient use of the cellular radio spectrum. Bluegrass Cellular also makes reasonable efforts, as required by the FCC, to avoid blocking the growth of other cellular systems that are likely to need additional capacity in the future.

Bluegrass Cellular will abide by FCC requirements in the construction of any future transmitter sites, including any that may be located within a 15 mile radius of the proposed site. When plans are developed, the specifications and propagation characteristics of any new facilities will be determined and will be presented to the FCC and other agencies or private parties whose operational interests may be affected by the proposal, as required by FCC rules and in keeping with the public interest.

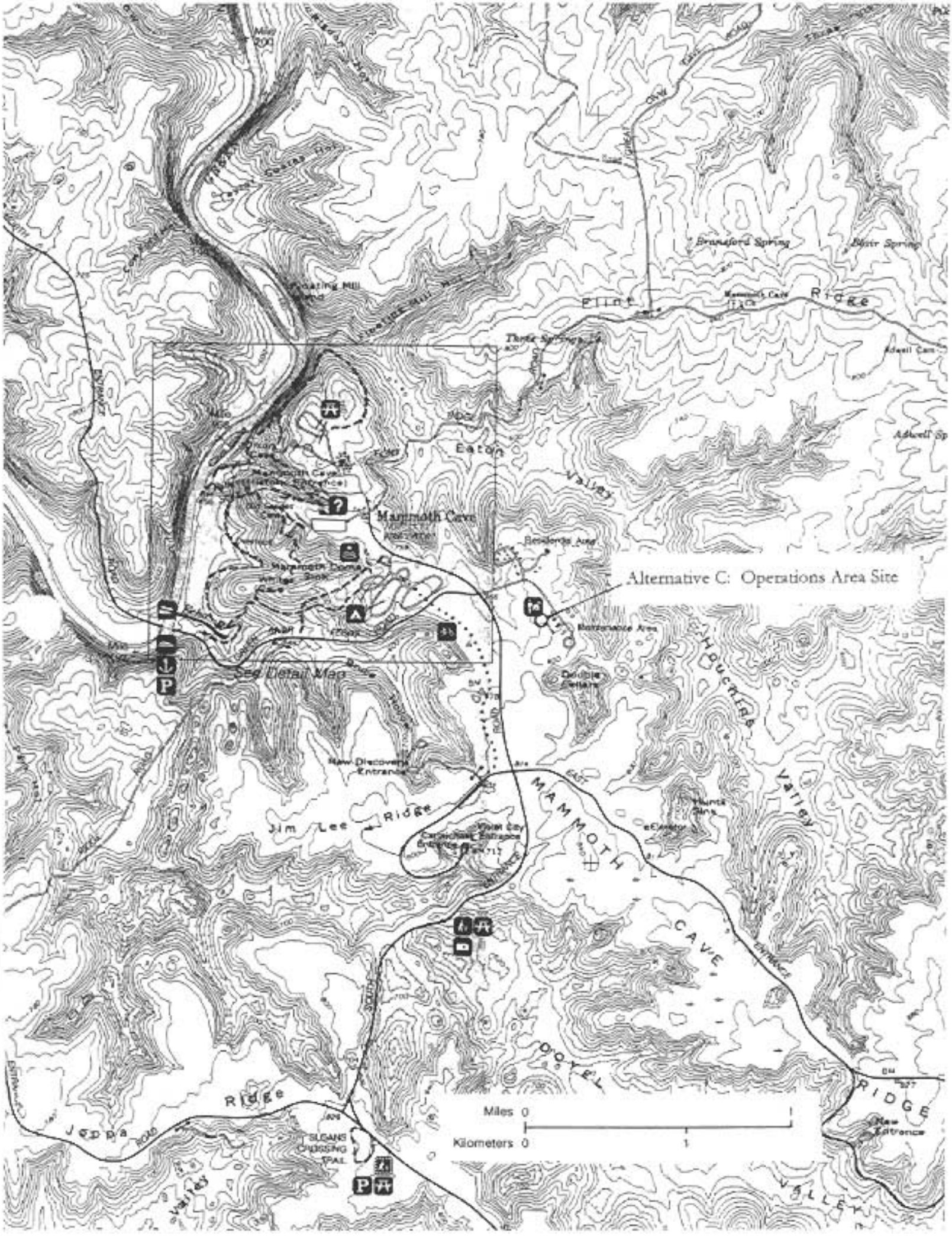
Attachment 3: Wilderness Study Map


PRELIMINARY - SUBJECT TO CHANGE
WILDERNESS STUDY
(NO WILDERNESS PROPOSED)
MAMMOTH CAVE NATIONAL PARK
KENTUCKY
UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
A
B
D
BROWNSVILLE
LOCK 6
HOUCHINS FERRY
BACONS KNOB
GOOD SPRING CHURCH
MAPLE SPRINGS
SAND CAVE ISLAND
MAMMOTH CAVE FERRY
JOPPA CHURCH
CEDAR SINK
WOOLSEY
GREEN RIVER
SCALE
IN MILES
LEGEND
PARK BOUNDARY
MAJOR ROADS
MINOR ROADS
MANAGEMENT ROADS
PROPOSED ROADS
RIVER
CHURCH
CAVE ENTRANCE
SEWER LINE
TELEPHONE
POWER LINE
WATER LINE
ROADLESS AREA
ACREAGE
TOTAL PARK
ROADLESS AREA
WILDERNESS UNIT
A 8,637 NONE
B 10,421 NONE
C 11,869 NONE
D 5,078 NONE
TOTALS 36,185


GREEN
RIVER
GREAT ONYX CAVE
C
CRYSTAL CAVE
GREEN
RIVER
MAPLE SPRINGS
GREAT ONYX CIVILIAN CONSERVATION CENTER
MAMMOTH CAVE CHURCH
FLINT RIDGE
CAVE HEADQUARTERS
COLOSSAL CAVE
SAND CAVE ISLAND
MAMMOTH CAVE FERRY
LEE CAVE
JOPPA CHURCH
D
WOODSEY VALLEY
LITTLE HOPE CHURCH
CAVE CITY
PARK CITY

Attachment 4: 7.5 minute topographic maps of the action alternative locations


Alternative B: Hickory Cabin Fire Tower Site
1352
Miles 0 1
Kilometers 0 1
Maple Springs
Good Spring
Cabin Knob


Alternative C: Operations Area Site
See Detail Map
Mammoth Cave
Flint Ridge
Eaton Valley
Houchins Valley
Mammoth Cave Ridge
Jim Lee Ridge
Joppa Ridge
Miles 0
Kilometers 0
1

Attachment 5: Section 7, Endangered Species Act Compliance

United States Department of the Interior
FISH AND WILDLIFE SERVICE
3761 GEORGETOWN ROAD
FRANKFORT, KY 40601

July 19, 2004

Mr. Ronald R. Switzer
Superintendent
National Park Service
Mammoth Cave National Park
Mammoth Cave, Kentucky 42259

Attn: Mr. Henry Holman

Subject: FWS #04-1424; Proposed Construction of Wireless Telecommunications Facilities at Hickory Cabin Fire Tower Site within Mammoth Cave National Park, Edmonson County, Kentucky

Dear Mr. Switzer:

This responds to your June 30, 2004, letter requesting our review of the Environmental Assessment (EA) prepared for the proposed construction of wireless telecommunications facilities at Hickory Cabin Fire Tower Site within Mammoth Cave National Park (MCNP). This proposal would provide reliable wireless telephone communication coverage. The proposed action would result in issuance of a right-of-way permit and construction and operation of wireless telecommunications facilities including a tower (180 feet tall), transmission, and support facilities surrounded by a security fence. Specifically, you have requested our concurrence with your determination that the proposed subject project would not likely to adversely affect threatened or endangered species under Section 7 of the Endangered Species Act. We have also reviewed the project for potential impacts to other federal trust species, including migratory birds.

Based on the information provided in the EA, we concur that the proposed project will not likely adversely affect the following federally listed or candidate species:

Indiana Bat
Gray bat
Kentucky cave shrimp
Rough pigtoe pearly mussel
Clubshell
Ring pink
Fanshell
Northern riffleshell
Tuberculed-blossom pearly mussel
Purple cat's paw pearly mussel
Bald eagle
Eggert's sunflower
Surprising cave beetle

According to the EA, the existing cleared area at the Hickory Cabin Fire Tower site would accommodate the footprint of the facility without additional clearing. If it is determined that

potential roost trees for the Indiana bat would need to be removed, their removal would be performed under the guidelines provided in MCNP's Hazard Tree and Vegetation Management Plan. In view of this, we believe that the requirements of section 7 have been fulfilled. Obligations under section 7 must be reconsidered, however, if: (1) new information reveals that the proposed project may affect listed species in a manner or to an extent not previously considered, (2) the proposed project is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated that might be affected by the proposed project.

As stated in the EA, the construction of wireless telecommunications facilities has the potential to negatively impact migratory birds. In 2000, the U.S. Fish and Wildlife Service (Service) issued voluntary guidelines to be used in making decisions regarding tower placement. The guidelines encourage co-location, heights of less than 200 feet above ground level, configurations that do not require guy wires and aviation warning lights, and other measures to reduce potential effects on migratory birds. MCNP has ensured that Service interim guidelines are followed on the proposed project at the Hickory Cabin Fire Tower site. Therefore, we have no concerns with regards to the impact of the proposed project on migratory birds.

We appreciate the opportunity to provide input on this project. If you have any questions or would like to further discuss the comments provided above, please contact me or Mike Armstrong at 502-695-0468.

Sincerely,

Virgil Lee Andrews, Jr.
Field Supervisor

Attachment 6: Section 106, National Historic Preservation Act Compliance

ERNIE FLETCHER
GOVERNOR

COMMERCE CABINET

KENTUCKY HERITAGE COUNCIL
THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
(502) 564-7005 (502) 564-5820 FAX
www.kentucky.gov

W. JAMES HOST
SECRETARY

DAVID L. MORGAN
EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

August 18, 2004

Mr. Ronald R. Switzer
Superintendent
National Park Service
Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, Kentucky 42259-0007

Re: Historic Buildings Survey for the Proposed Hickory Cabin Firetower Telecommunications Tower Site, Mammoth Cave, Kentucky

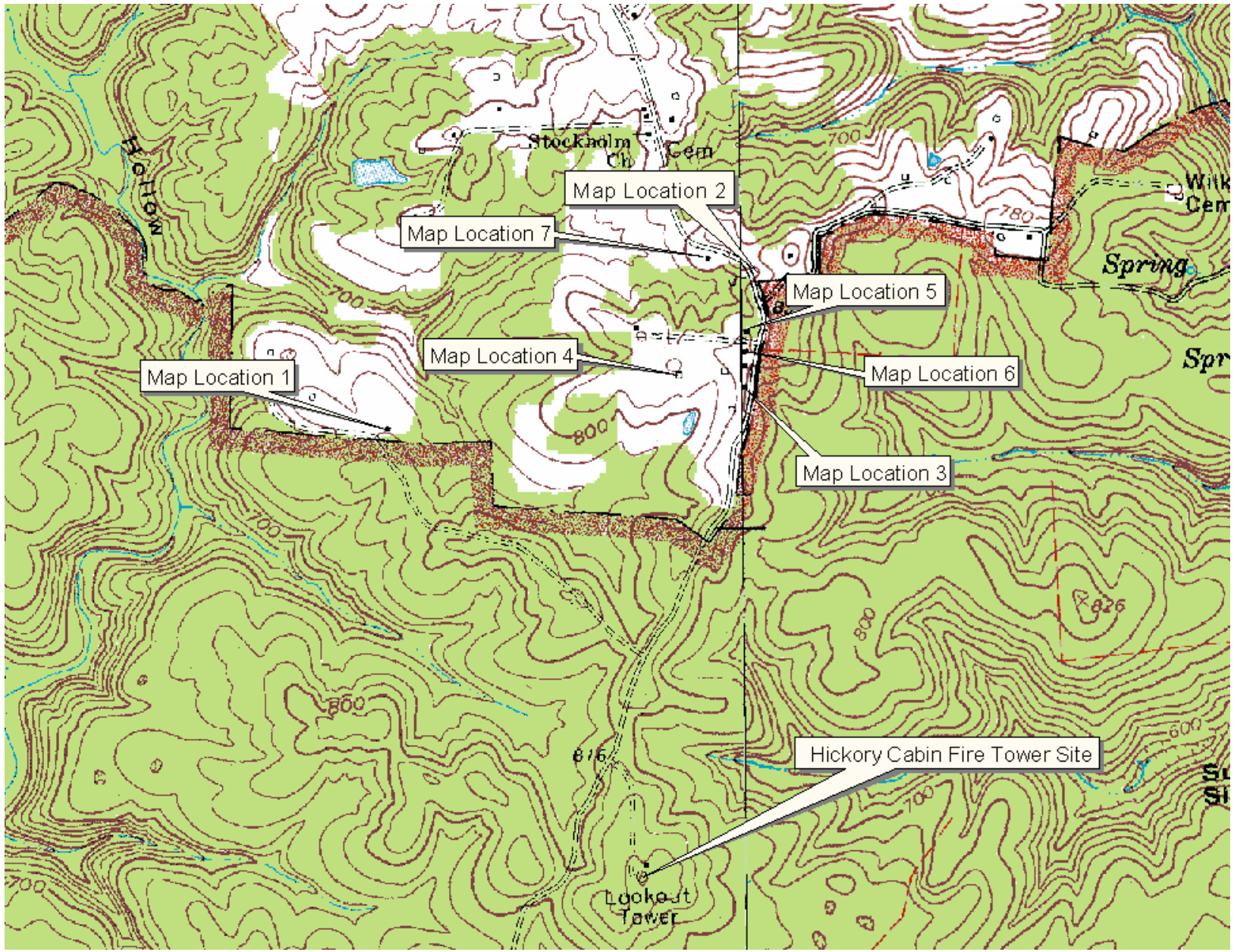
Dear Mr. Switzer:

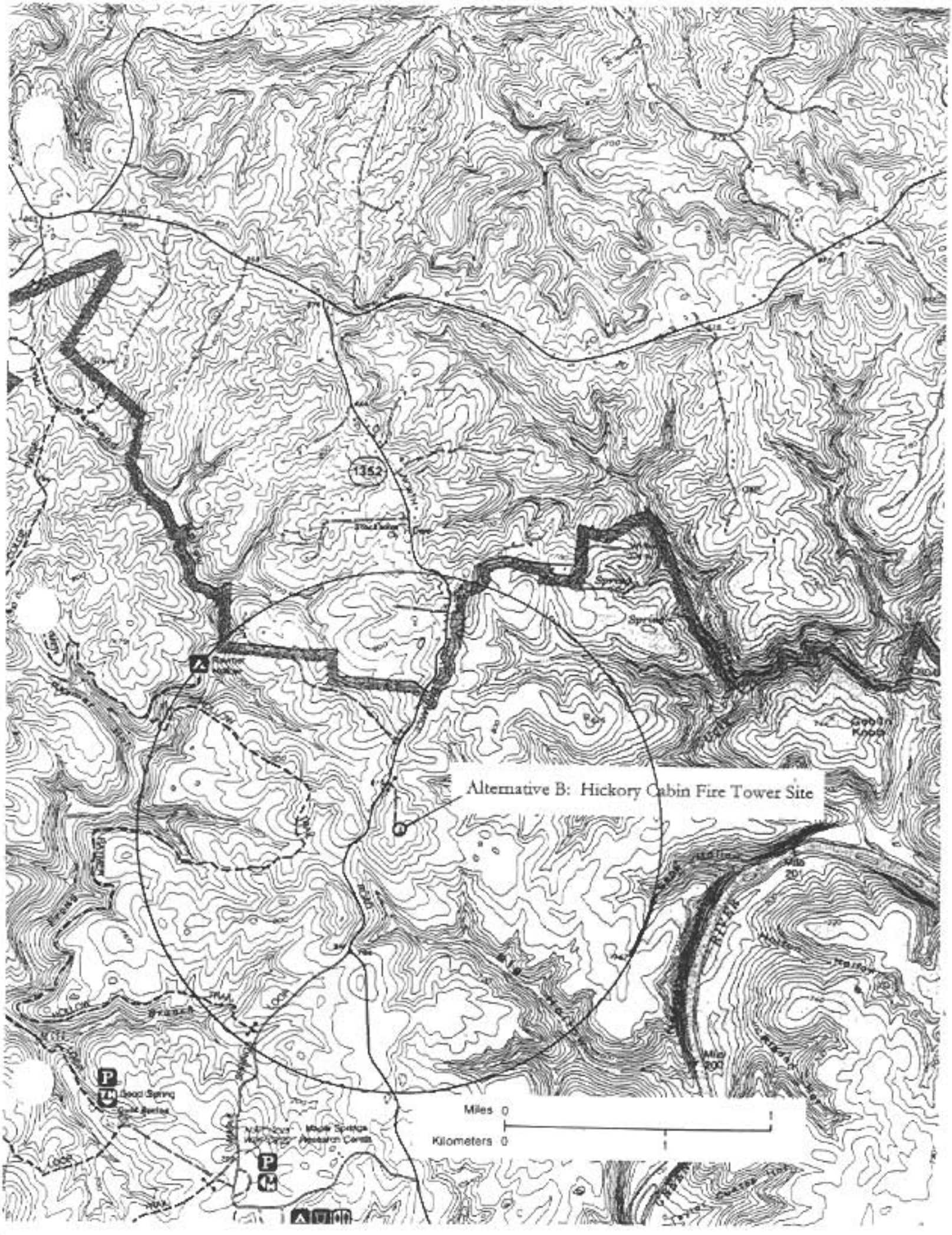
The State Historic Preservation Office has received for review and approval the above referenced historic buildings survey completed by Bob Ward of your staff. In compliance with the Kentucky Heritage Council's Memorandum of September 1, 2001 regarding cellular tower report writing, Mr. Ward surveyed the prescribed one-mile (diameter) Area of Potential Effect surrounding the proposed tower site. Of the seven (7) structures identified in the survey, only one appears to have National Register eligibility potential. We are in agreement that the Barbee Store (constructed circa 1920) is potentially eligible under Criteria A. It is the finding of this office, however, that no potential exists for adverse impacts from the proposed tower to the resource. The reasoning for this determination are threefold: 1) the potential significance of the property is not associated with its architectural merit or its connection with setting. 2) The historic and structural integrity of the structure are marginal and the proposed tower will have no positive or negative impact upon them. 3) The structure has been heavily overgrown and views of the tower will be obstructed.

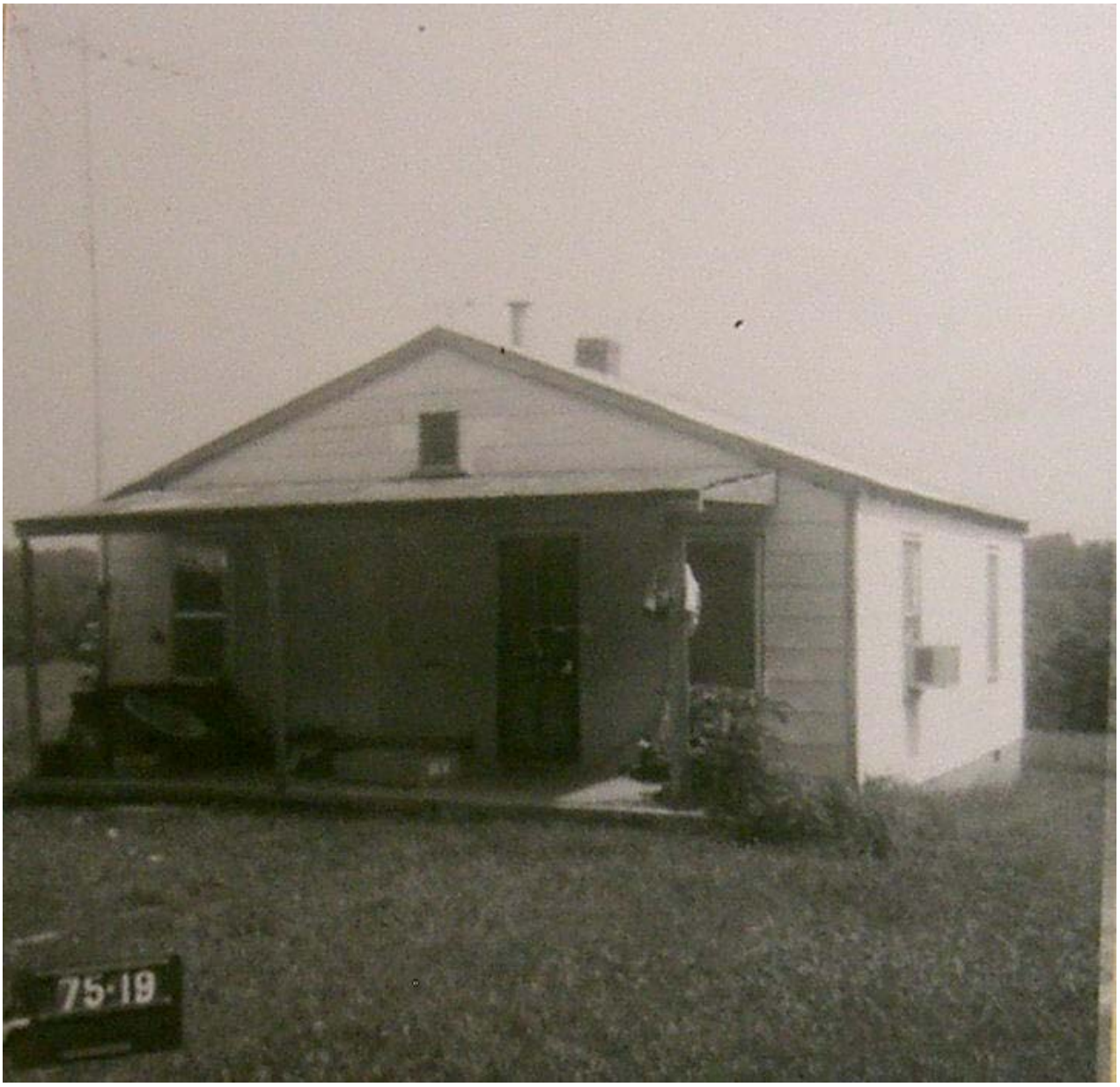
Therefore, in accordance with 36CFR Part 800.4(d) of the Advisory Council's revised regulations, our finding is that there will be **No Effect to Historic Properties** as a result of this undertaking. Further review will no longer be required and the project may proceed as planned. Should you have any questions, please feel free to contact me at 502-564-7005.

Sincerely,

David L. Morgan, Director
Kentucky Heritage Council and
State Historic Preservation Officer


Map Location 2
Map Location 7
Map Location 5
Map Location 4
Map Location 6
Map Location 1
Map Location 3
Hickory Cabin Fire Tower Site
Stockholm Cem
Spring
Lookout Tower
700
800
780
600


Alternative B: Hickory Cabin Fire Tower Site
1352
Miles 0
Kilometers 0



Map Location 1

The Donald Bailey house (1975) --from Edmonson County PVA files

Constructed circa 1930

Map Location 1

The Donald Bailey house, June 4, 2004
Constructed circa 1930

Map Location 2

Willie Barbee Store – Courtesy of Normal Warnell ca. 1991

Constructed circa 1920

Map Location 2

Willie Barbee Store June 2, 2004

Constructed circa 1920

Map Location 3

Patsy Thompson House, June 2, 2004

Constructed circa 1930

Map Location 3

Barn on Patsy Thompson Property, June 2, 2004

Map Location 3

Barn on Patsy Thompson Property, June 2, 2004

Map Location 4

Barn on Cecil Ramsey Property – Associated with the Paul Burba House, June 2, 2004

Map Location 4

Paul Burba House, June 2, 2004

Constructed circa 1930

Map Location 4

Outbuildings Associated with Paul Burba House on Cecil Ramsey Property, June 2, 2004

Map Location 4

Paul Burba House and outbuilding, June 2, 2004

Map Location 5

Lena May Butler House, June 2, 2004

Constructed circa 1930

Map Location 6

Arlene Thompson House, June 2, 2004

Constructed circa 1930

Map Location 7

Dillingham House, June 2, 2004

Constructed circa 1940

ERNIE FLETCHER
GOVERNOR

COMMERCE CABINET

KENTUCKY HERITAGE COUNCIL
THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
(502) 564-7005 (502) 564-5820 FAX
www.kentucky.gov

W. JAMES HOST
SECRETARY

DAVID L. MORGAN
EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

June 28, 2004

Mr. Robert Ward
Mammoth Cave National Park
P. O. Box 7
Mammoth Cave, Kentucky 42259

Dear Mr. Ward:

The State Historic Preservation Office has received for review and approval an archaeological report entitled "A Phase I Archaeological Survey for the Proposed Hickory Cabin Cell Tower, Mammoth Cave National Park, Edmonson County, Kentucky" by Patrick D. Trader and Dona R. Daugherty.

The survey found no evidence of prehistoric or early historic occupation in the project area. I concur with the author's findings and clear this project for archaeological resources. However, the project should not be considered completely cleared by this office until the culture historical report is reviewed and commented upon.

Should you have any questions, feel free to contact Charles Hockensmith of my staff at (502) 564-7005.

Sincerely,

David L. Morgan, Director
Kentucky Heritage Council and
State Historic Preservation Officer

cc: Mr. Patrick D. Trader
Dr. George Crothers

Education, Arts and Humanities Cabinet

KENTUCKY HERITAGE COUNCIL
The State Historic Preservation Office

Paul E. Patton
Governor
Marlene M. Helm
Cabinet Secretary

David L. Morgan
Executive Director and
SHPO

MEMORANDUM

September 1, 2001

To: Communication Tower Licensees and Environmental Consultants
Re: Historic and Archaeological Surveys Required for Cellular/Communication Towers in Kentucky

This memorandum is being issued to announce a new policy regarding the identification and evaluation of historic and archaeological properties during the licensing of cellular communication towers within the state of Kentucky conducted pursuant to the requirements of Section 106 of the National Historic Preservation Act and its implementing regulation, 36 CFR Part 800. Effective immediately, the following policy is in effect:

1. New construction:

   a. An archaeological survey is required unless the site has been heavily disturbed by prior construction such as strip mining (plowing for agricultural use is not considered prior disturbance). The survey must be carried out at the construction site and access road by a qualified professional archaeologist who is included in the Kentucky SHPO's list of archaeological consultants. The survey and survey report must conform to the Kentucky SHPO's Specifications (June 2001, available at the KHC web site). Two **original** copies of the survey report must be submitted with an appropriate cover letter to the Kentucky SHPO for review and comment. No ground disturbance may occur until the Section 106 review is completed. Proof of disturbance must be in the form of a letter from a qualified archaeologist included in the Kentucky SHPO's list of archaeological consultants describing the nature of the disturbance and stating that, in his or her professional opinion, it is unlikely that any sites would have survived the disturbance.

   b. All structures that are 50 years old or older within the one-mile APE must be surveyed by a qualified professional historian or architectural historian who is included in the Kentucky SHPO's list of Section 106 consultants. The survey and survey report must conform to the Kentucky SHPO's Specifications (June 2001). One **original** copy of

the survey report must be submitted with an appropriate cover letter to the Kentucky SHPO for review and comment. If there are no structures over 50 years old within the one-mile APE, a historic survey is not needed.

2. Co-Locations:

Most co-locations will not need either archaeological or historical surveys.

a. Co- locations on existing cellular towers less than one year old do not require surveys; **HOWEVER**, you must provide documentation to the Kentucky SHPO showing the tower was reviewed and approved by the SHPO. Acceptable documentation would include a clearance letter signed by the Kentucky SHPO, or other correspondence from the SHPO indicating the tower had been reviewed by the SHPO staff and that all Section 106 issues were resolved.

b. Co-locations on existing cellular towers over one year old do not require surveys. No contact with the Kentucky SHPO is needed and you may cite this Memorandum as evidence of compliance with the requirements of 36 CFR Part 800 with respect to consultation with the SHPO.

c. Co-locations on water towers, buildings, and other structures will require a historic survey if they are 50 years of age, or if there are any buildings or structures 50 years old or older within the 1-mile APE.

This new policy should greatly improve the review of cellular tower construction within Kentucky. It should result in a savings of time and money to companies seeking to license towers, and it will result in the better treatment and protection of historic and archaeological sites. If there are any questions concerning the need for surveys, or unique circumstances not covered by this statement, please do not hesitate to contact the SHPO Site Protection Program staff at (502) 564-7005.

- General environmental consultants will no longer come to the Kentucky Heritage Council office for background site checks, nor will they need to gather information on historic and archaeological data at the construction site. This work will be done instead by professional archaeologists and historians as a normal part of their report preparation. No correspondence or other documentation will need to be submitted to the SHPO other than the survey reports and transmittal letter.

- Determinations of National Register eligibility and project effect pursuant to Section 106 requirements will be made by qualified professional historians and archaeologists, as required by 36 CFR Part 800.

- Project review time will be cut from 60-90 days to 30 days in most cases.

United States Department of the Interior
NATIONAL PARK SERVICE
Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, Kentucky 42259-0007

IN REPLY REFER TO:
H4217

June 3, 2004

Mr. David L. Morgan
Director and State Historic
Preservation Officer
Kentucky Heritage Council
North Washington Street
Frankfort, Kentucky 40601

Dear Mr. Morgan:

We are working with cellular telephone service providers to install a cellular communication tower inside the boundaries of Mammoth Cave National Park north of Green River at the site of the former Hickory Cabin Piretower. We believe this cellular communication tower to be essential from a public safety standpoint and will likely eventually assist in protection of park resources by reducing law enforcement and fire protection response times.

The Hickory Cabin Piretower structures were demolished in the early 1980's and the site has been used by the park for storing construction materials. The site is already heavily impacted from its original and subsequent uses. Additionally, compared to areas adjacent to the park, the heavily forested canopy surrounding the site will lessen the visibility from other locations, including private property outside the boundary.

Pursuant to the Mammoth Cave National Park Programmatic Agreement and your policy issued September 1, 2001, regarding the new construction of cellular communication towers, we have had an archaeological survey carried out at the proposed construction site for the cellular communication tower and the associated access road by the University of Kentucky's Program For Archaeological Research. The archaeological survey found no cultural

resources present within the construction site and the access road. The archaeological survey report will be provided to your office within the next two weeks.

We have also had our park historian, Bob Ward, conduct a historic building survey of the private property located within the one-mile Area of Potential Effects (APE), as called for in your September 1, 2001 guidance. The historic structure survey identified seven structures which local residents indicated are likely to be more than 50 years old. Enclosed are notes from the survey and a CD-ROM containing photographs of the seven structures.

All but one of these structures appear to lack historical integrity due to modifications or additions, and we would therefore, recommend to be not eligible to the National Register of Historic Places. However, one structure, identified as the Barbee Store, circa 1920, appears not to have been modified and could be considered eligible for the National Register under Criteria A. The structure housed a telephone exchange which reportedly was connected to the Mammoth Cave exchange.

Thank you for your time and attention to this matter. If you have questions, please call Management Assistant Henry Holman at (270) 758-2187 or Cultural Resource Specialist Bob Ward at (270) 758-2139.

Sincerely,

Ronald R. Switzer
Superintendent

Enclosures

NOTES ON EXISTING STRUCTURES
IN THE STOCKHOLM COMMUNITY
June 2, 2004

Overview:

Stockholm, Kentucky is located on Highway 1352 approximately one-half mile north from the boundary of Mammoth Cave National Park. Around 1885, the community of Stockholm was settled as a part of an attempt to bring Scandinavian people to Edmonson County to work in the lumber industry. Stockholm was designed with streets named and marked, but the plan was never executed and the village was never incorporated. Many of the Scandinavian families eventually moved to the western part of Edmonson County and settled in an area known as Sweden, which is located along present day Highway 259. (Mammoth Cave Forgotten Stories of it's People, Norman Warnell, 1997, pages 112-116 and from personal communication with Norman Warnell, June 2, 2004.)

Reportedly, some of the existing structures in Stockholm were either totally built from or added on to with building materials taken from houses removed from areas within Mammoth Cave National Park, which was established from 1926 to 1941. According to local residents contacted, one former store building and six houses are likely to be more than 50 years old. Two of the residences and the store building appear to be abandoned. All are vernacular architecture and all but one structure have apparently been considerably modified since the original construction date. The structure known as the Barbee Store probably dates to the 1920's and reportedly housed a telephone exchange which was connected with the Mammoth Cave exchange. This resource, while in very poor structural condition, appears to have historical integrity, as no additions or modifications are apparent.

Existing Structures:

Paul Burba House, circa 1930
Patsy Thompson's residence, circa 1900
Arlene Thompson's residence, circa 1930
Lena May Butler's house, circa 1930
Dillingham house, circa 1940
Bailey Property house, circa 1930
Barbee Store, circa 1920

Attachment 7: Letter from Richard Tell Associates, Inc., February 27, 2004, containing "Analysis of RF emissions associated with proposed Bluegrass Cellular cellular telephone tower in Mammoth Cave National Park"

February 27, 2004

Leila Rezanavaz
Lukas, Nace, Gutierrez & Sachs
1111 19th Street, N.W.
Suite 1200
Washington, DC 20036

Reference: Analysis of RF emissions associated with proposed Bluegrass Cellular cellular telephone tower in Mammoth Cave National Park

Dear Ms. Rezanavaz:

Introduction

This letter report summarizes my analysis of the radiofrequency (RF) fields that could be associated with operation of a Bluegrass Cellular cellular telephone base-station tower to be located in the Mammoth Cave National Park. The purpose of this analysis was to estimate the maximum possible RF fields that might be found in the vicinity of the proposed tower associated with its operation of transmitting cellular telephone signals. The analysis results were then compared to human exposure limits recommended by the Institute of Electrical and Electronics Engineers (IEEE) to assess whether operation of the proposed tower will be in compliance with the IEEE standard C95.1-1991 (1999 edition).

The Proposed Installation

Bluegrass Cellular has proposed to install a 180 foot tall self-supporting tower inside the Mammoth Cave National Park for the purpose of supporting an array of nine panel type antennas that will be used for providing cellular telephone service in the region. The antennas would be installed such that the centers of the antennas are at 182 feet above the base of the tower and arranged in a triangular fashion with three antennas oriented in each of three directions (sectors), each spaced 120 degrees apart. Two of the antennas in each sector would provide for both reception and transmission of cellular signals and one would be dedicated to reception only. The antennas are proposed to be manufactured by DAPA and are of the panel type measuring 51 inches in height and 9.3 inches in width. Each antenna possesses a directional pattern which causes the transmitted signals to be strongest along a specific direction from the antenna with weaker signals to either side of this "main beam" direction. The azimuth plane beam width is 102°. This means that the transmitted signal power density decreases to one half of the main beam value at 51° either side of the main-beam maximum. Through the combination of three sectors, the tower will be able to provide cellular service in all directions away from the tower.

Each of the two transmitting antennas in each sector may have as much as 10 watts of RF power delivered to it to provide the signals from the tower site. The DAPA Model 2960.006 antenna possesses a maximum gain of 12 decibels relative to that of a half-wave dipole antenna (equivalent to power gain of 15.8). The system would operate in the 806-960 MHz frequency range.

No other RF sources such as other wireless communications facilities or broadcasting stations are located within one mile of the proposed site.

Analysis Approach Used in Evaluation

Far-field Analysis for Ground Level Values of Power Density

Calculated values of power densities were computed using recommended methodologies contained in FCC Bulletin OET-65[1]. First, a far-field method was used to calculate the maximum possible RF field power density that could exist near ground level as a function of distance from the tower. This method was used to determine RF fields that members of the general public might experience if near the tower. Second, a near-field method was used to estimate the potential RF fields that might exist in the immediate space near the antennas wherein workers on the tower might have access. Thus, the intent of this analysis was to evaluate potential exposure of both the public and workers to the RF fields that could be produced by operation of the tower and to compare these calculated results to the IEEE exposure limits.

The mathematical expression used for calculating RF power densities in the far field was:

$$S = \frac{P_t \times 10^6 \times 1.64 \times 2.56 \times G_{el} \ x100}{4\pi R^2 \times 929.03} \qquad \text{Equation 1}$$

where,
S = power density (mW/cm^2);
G_{el} = antenna power gain relative to a half-wave dipole antenna in elevation plane at relevant elevation angles (for this analysis, the relevant elevation angles are those lying between the horizontal and 90 degrees below the horizontal);
1.64 = power gain of half-wave dipole to correct for antenna gain being referenced to a dipole;
2.56 = estimated ground reflection factor recommended by the FCC;
R = slant range from antenna center of transmission to points along the ground but six feet above the ground (ft);

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[1] *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Field*s. FCC publication OET Bulletin 65 (edition 97-01), Supplement A *(Additional Information for Radio and Television Broadcast Station*s), page 30. Published by the FCC's Office of Engineering and Technology, Washington, DC, August 1997.

The factor of 10^6 converts from watts to microwatts and the factor of 929.03 converts from units of square feet to square centimeters.

It should be noted that this methodology is highly conservative since it predicts the maximum point-in-space value of power density rather than the spatially averaged value. Exposure limits in the IEEE standard are specified in terms of spatially averaged values over the dimensions of the human body. Typically the spatially averaged power density will be significantly less than the spatial peak value given by Equation 1.

The azimuth plane antenna pattern for the proposed antennas is given in Figure 1 where the relative power gain of the DAPA Model 2960.006 antenna is plotted as a function of azimuth angle relative to the antenna. The transmitted signal power density will decrease as the direction relative to the main beam direction is increased. Directly behind the antenna, the relative power density is only slightly greater than 1% of the value directly in front of the antenna. This high front-to-back ratio means that potential exposure levels behind the transmit antennas will be very low compared to that directly in front of the antenna.

The antenna's ability to direct the transmitted signals mainly toward the horizon can be seen in Figure 2. The power gain of the antenna is shown as a function of the elevation angle below the horizontal. Directly beneath the antenna, near the tower base, the relative power density will be less than 1% of the value directly horizontal to the antenna. This elevation plane directivity is used to more efficiently make use of the transmitted power to reach the intended coverage area rather than uselessly transmitting it straight downward toward the ground at close range.

Equation 1 was used to calculate the expected power density that would exist along a straight line extending from the base of the tower outward, away from the tower. The maximum signal strength will occur along directions that correspond to the pointing directions of the transmitting antennas with somewhat lesser values of signal strength either side of these pointing directions. However, if the transmitting antennas in the other two sectors are also transmitting at the same time, there will be some, albeit small, contribution of those other antennas to the total power density that will exist along the main beam direction of any one of the transmitting antennas. This small effect was investigated by examining the relative contribution that each of the three sectors would make to the total power density in Figure 3. In this figure, the azimuth pattern for each of the three sectors is plotted on a linear scale in which the maximum value has been normalized to unity along each sector's direction. The summation of the relative field power densities was then determined for each azimuth angle and also plotted in the figure. It can be seen than the contribution of the other two sectors can be as much as 6.8% to that that would exist due to a single sector alone. This finding was then used to correct the far-field analysis results for a single sector to obtain the maximum possible power density that could ever exist in any direction from the tower. This was accomplished by multiplying the computed values by 1.068 to take account of this possible signal addition effect.

Near-field Analysis for Tower Work Values of Power Density

To evaluate potential RF exposure of personnel who may have need to access the upper region of the tower for maintenance or repair work, a near-field analysis method was employed. This method made use of the RF compliance software modeling program called RoofView®.[2] RoofView® incorporates a cylindrical model for estimating spatially averaged RF field exposure associated with the operation of vertical collinear antennas of the type to be used on the subject tower. The model, described in FCC OET Bulletin 65, distributes the transmitted power from the antenna over the surface area of an imaginary cylinder that surrounds an omnidirectional antenna similar to that illustrated in Figure 4. Figure 5 illustrates the modified cylindrical model applied to sector type antennas in which the transmitted power is distributed over only a portion of the cylinder defined by the azimuth beam width of the antenna. RoofView® is widely used throughout the wireless industry for examining compliance at antenna sites and is a conservative method in that it tends to over-calculate the spatially averaged field compared to the actual field. The RoofView® software expresses all calculated values of field in terms of a percentage of the maximum permissible exposure (MPE) limit taking into account the frequency dependency of the MPE limit. The cylindrical model has been evaluated rather extensively[3]. For example, the cylindrical model has been used for computing RF fields in the near-field region of vertical collinear antennas and is discussed in some depth in various technical reports including Tell (1995, 1996). Faraone and colleagues at the Motorola Florida Research Laboratories have provided an independent evaluation of the utility of the cylindrical model (Faraone, et al., 2000). The cylindrical model is also recognized by the Federal Communications Commission in their OET Bulletin 65 (FCC, 1997).

The proposed antenna mounting geometry of the antennas is shown in Figure 6 where three antennas are directed toward each of the three sectors. The antennas designated with the label TX are those to be used for transmitting cellular signals. RX designates those for reception.

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[2] RoofView® is a registered trademark of Richard Tell Associates, Inc.

[3] Faraone, A., R. Y-S Tay, K. H. Joyner and Q. Balzano (2000). Estimation of the average power density in the vicinity of cellular base-station collinear array antennas. IEEE Transactions on Vehicular Technology, Vol. 49, No. 3, pp. 984-996.

Tell, R. A. (1996). *CTIA's EME Design and Operation Considerations for Wireless Antenna Sites*. Technical report prepared for the Cellular Telecommunications Industry Association, 1250 Connecticut Avenue, N.W., Washington, DC 20036. August 12, 83 p.

Tell, R. A. (1995). *Engineering Services for Measurement and Analysis of Radiofrequency (RF) Fields*. Technical report prepared for the Federal Communications Commission, Office of Engineering and Technology, Washington, DC, FCC/OET RTA 95-01 [NTIS order no. PB95-253829].

The IEEE Exposure Limits

The U. S. National Park Service applies the requirements of the National Telecommuncations and Information Administration (NTIA) relative to human exposure to RF fields. NTIA has adopted use of the recommendations of the IEEE. Two sets of IEEE MPE limits are contained in the IEEE standard C95.1-1991 (1999 edition). A more permissive set of limits applies to so-called controlled environments wherein personnel having access have been made aware of the potential of RF exposures, have received RF safety awareness training, and are provided with a means for controlling their exposure if such is needed. Often, the controlled environment MPE limits are associated with occupational exposures. Another, more stringent set of MPE limits is applied to so-called uncontrolled environments in which, generally, members of the general public may exist. Individuals in uncontrolled environments may have no knowledge of their exposure to RF fields and certainly have not been provided with RF safety awareness training. These limits are five fold more stringent in terms of permitted power densities to which the body may be exposed. Generally, the MPE limits are frequency dependent. In the frequency range of the cellular telephone communications band (806-960 MHz), the MPE limits, for continuous exposure, correspond to:

Type of environment	MPE limit (microwatts per square centimeter)
Controlled environment	2,690
Uncontrolled environment	537

Hence, the results of each analysis were compared to these values for assessing the likelihood of compliance or noncompliance with the IEEE standard.

Federal Communications Commission Exposure Rules

While the U.S. Park Service applies the NTIA criteria (IEEE standard) for evaluating RF exposures, it should be noted that all FCC licensees must comply with the regulations of the FCC relative to RF exposure as well. The FCC exposure limits are somewhat different than those of the IEEE standard but in the frequency range relevant to the proposed cellular telephone base station in this study, the exposure limits are the same. Hence, compliance with the IEEE limits ensure compliance with the FCC limits for the cellular telephone band used in this study.

Far-field Analysis Results

Figure 7 represents the results of the “worst-case” analysis of RF fields at ground level as a function of lateral distance from the proposed cellular base-station tower. The calculated values of RF fields are expressed directly as power density. Figure 6 shows the aggregate maximum field from the tower is expected to vary with distance, producing a maximum power density at approximately 1,100 feet from the tower. The spatial variation in the power density is due to the particular elevation plane pattern of the antennas shown in Figure 2. An absolute maximum, ground-level RF field of 0.0373 microwatts per square centimeter was obtained from the analysis. This value, when

compared to the MPE limit established for uncontrolled environments and general public exposures (537 microwatts per square centimeter) is approximately 14,400 times less.

Near-field Analysis Results

Possible personnel exposures are illustrated in Figures 8 through 14 where RoofView® RF field plots are shown for the region in the immediate vicinity of the top-mounted antennas. Each plot is illustrated for a different height of the bottom of the antennas relative to the level at which an individual might be located. For example, a worker might be suspended in a harness from a crane or standing in a bucket from a tall bucket truck near the antennas. Alternatively, they might be on the tower structure or the mounting frame for the antennas. Each figure illustrates a top-down view of the RF field distribution where the different colors represent different levels of field. In these figures, green represents RF fields that are less than 5% of the controlled environment MPE limit. Yellow represents RF fields less than 20% of the controlled environment MPE limit (this happens to correspond in the cellular telephone frequency band to the uncontrolled environment MPE limit), red represents RF fields less than 100% of the controlled environment MPE limit and blue represents RF fields exceeding the controlled environment MPE limit. Note that blue does not appear in any of the field plots.

These figures show that, generally, most regions around the antennas will not exceed even the uncontrolled environment limit, at least at distances beyond about 3 feet from any antenna. This finding holds even for individuals elevated to the height of the antennas as illustrated in Figure 8. It should be noted that 20% of the controlled environment MPE limit corresponds, within the cellular telephone frequency band, to 100% of the uncontrolled environment MPE limit. Hence, areas within the RF field plots that are yellow are projected to comply with the general public MPE limit since they will be less than 20% of the controlled environment MPE limit.

A significant finding of the near-field analysis is that exposure of personnel immediately near the panel antennas is not expected to exceed the controlled environment MPE limit since no areas are shown with the blue color. This finding is principally due to the low power used by the system. When the mounting height of the antennas is increased with respect to the location of a person, the spatially averaged field decreases in value as illustrated in Figures 9 through 14. When the bottom of the antennas is 6 feet above the standing level of a person near the antennas, almost all of the area is less than even 5% of the occupational MPE limit (this would correspond to less than 25% of the uncontrolled environment MPE limit).

Conclusions on Compliance

A comprehensive analysis of RF fields that might be produced by operation of a proposed cellular telephone base station operated by Bluegrass Cellular in the Mammoth Cave National Park shows that only extremely weak RF fields will be produced at ground level anywhere around the tower. These fields will be, at most, some 14,400 times less

than the more stringent uncontrolled environment MPE limits used by both the NTIA and FCC.

Occupational exposure of personnel who might have reason to access the immediate region of the transmitting antennas atop the tower could exceed the limits set for the general public but only if located within approximately 3 feet of the front of a transmitting antenna. Other regions, for example, directly behind the antennas will exhibit much weaker fields, typically less than 5% of the MPE limit set for controlled environments. The analysis does not suggest that personnel exposures, even immediately adjacent to the antennas, will exceed the limits established for controlled environments. Nonetheless, since it is possible that the MPE limit for the general public could conceptually be exceeded under extenuating circumstances when a worker might be located immediately in front of an antenna for certain maintenance or repair operations, it is recommended that anytime personnel have need to access the upper region of the tower, a personal RF monitor be worn to alert the worker to the presence of RF fields that might approach the controlled environment MPE limit. In addition, all personnel accessing the tower should be provided with RF safety awareness training.

If you have any questions regarding this analysis, I will be happy to provide more detailed explanations. I am attaching as a separate document a detailed resume for myself that provides information on my background and experience in RF safety matters.

Respectfully yours,

Richard A. Tell

Richard A. Tell
President

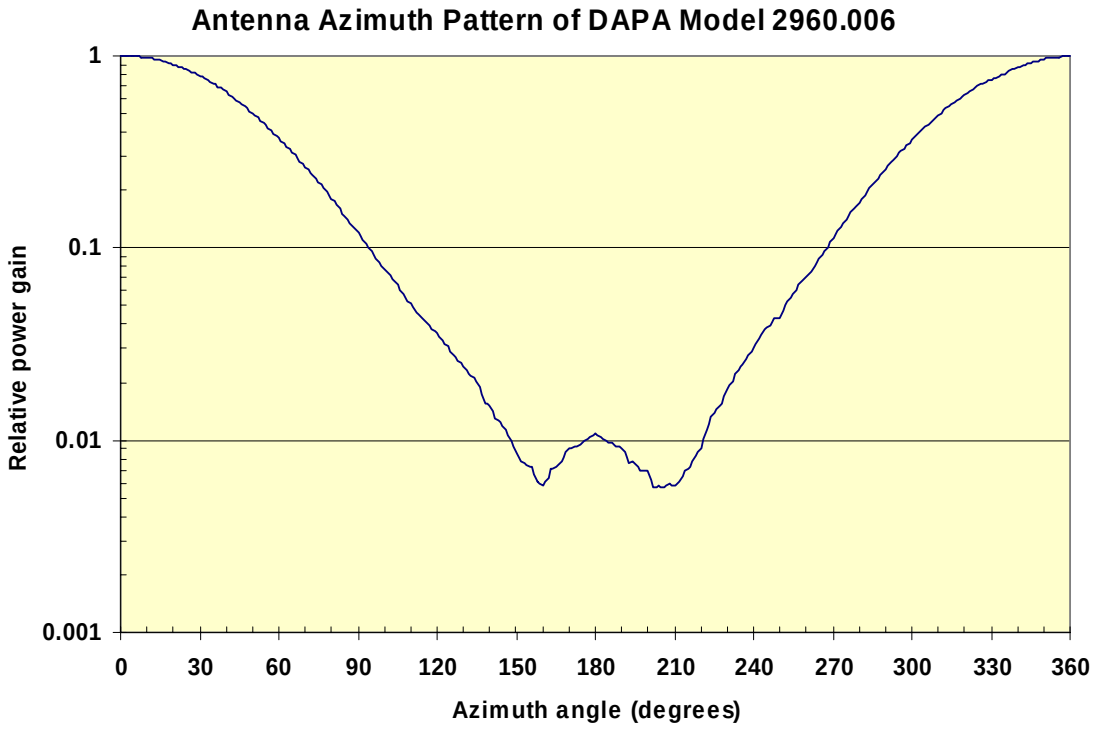

Figure 1. Relative power gain azimuth pattern of the DAPA Model 2960.006 antenna.

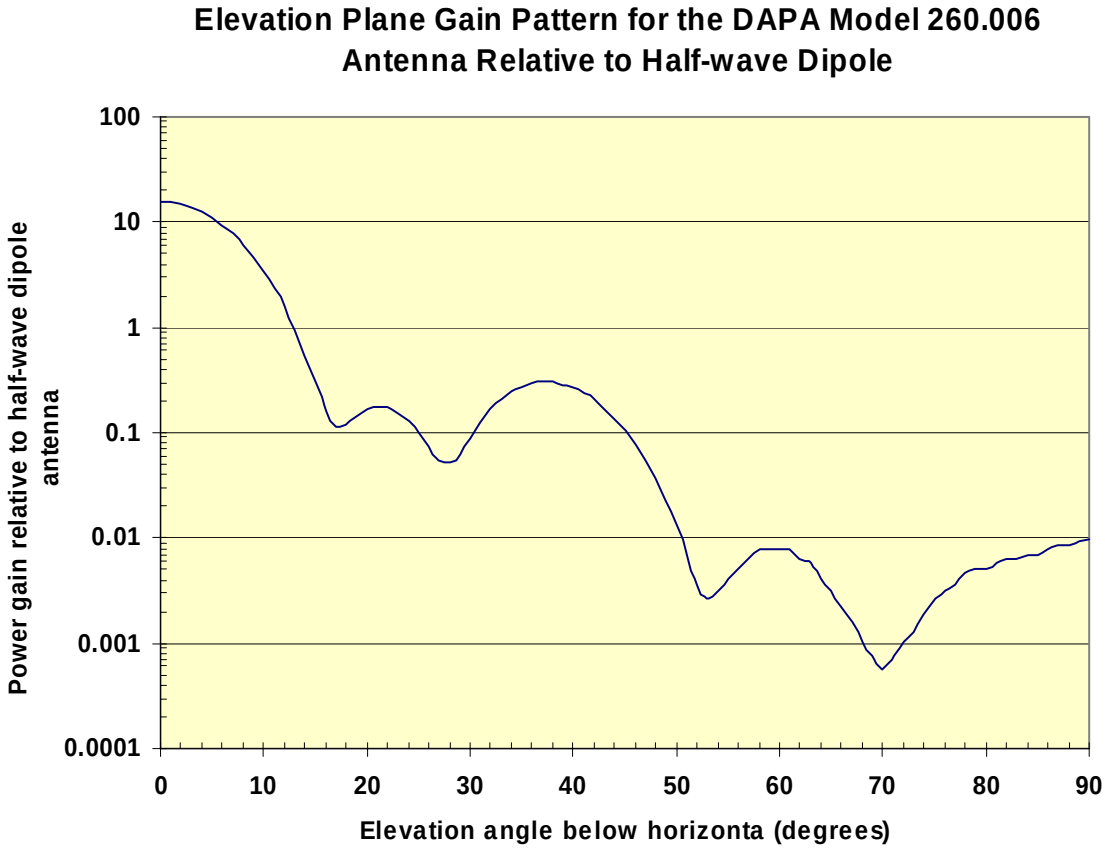

Figure 2. Elevation plane gain pattern for the DAPA Model 2960.006 panel antenna proposed for use at the Mammoth Cave National Park cellular base station site operated by Bluegrass Cellular. The gain is specified in deceibels relative to a half-wave dipole antenna (dBd).

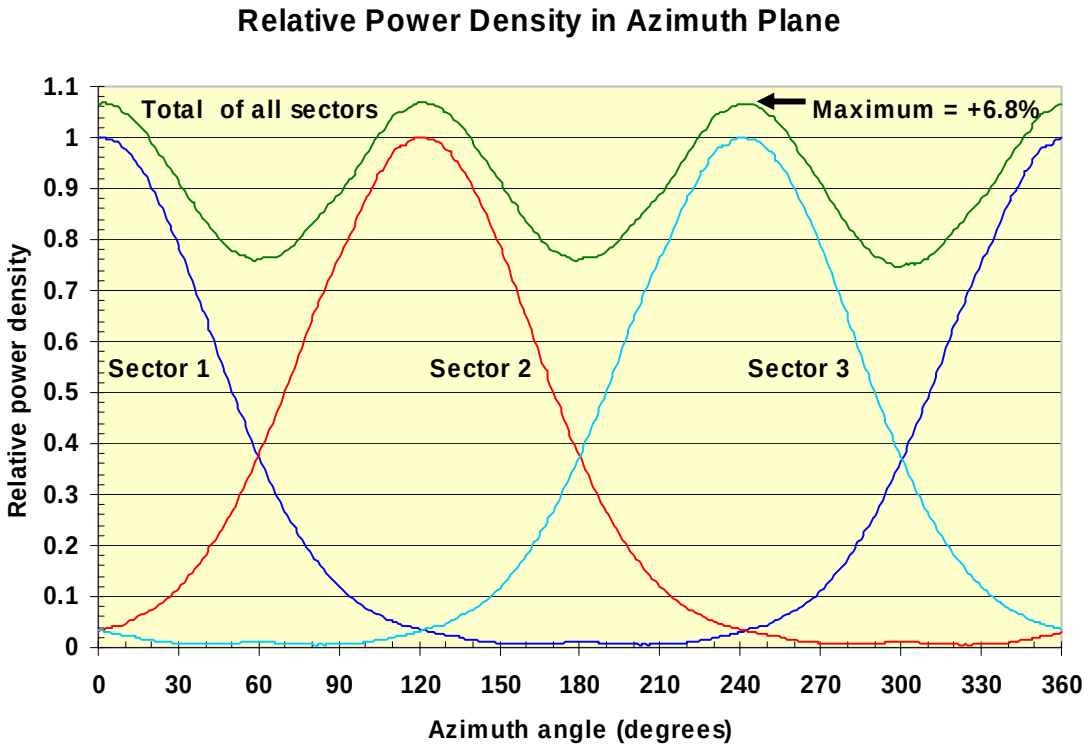

Figure 3. Relative power density at different azimuth angles at the proposed cellular base station for emissions from each of the three sectors of transmit antennas and the additive total relative power density at any given azimuth angle due to summation of RF fields from all three sectors. The maximum power density is always along the pointing direction of one of the three sectors but is slightly increased in value due to small contributions of emissions from transmit antennas in the other two sectors. The maximum enhancement in total power density due to operation of other sectors is 6.8% along the direction of any one sector.

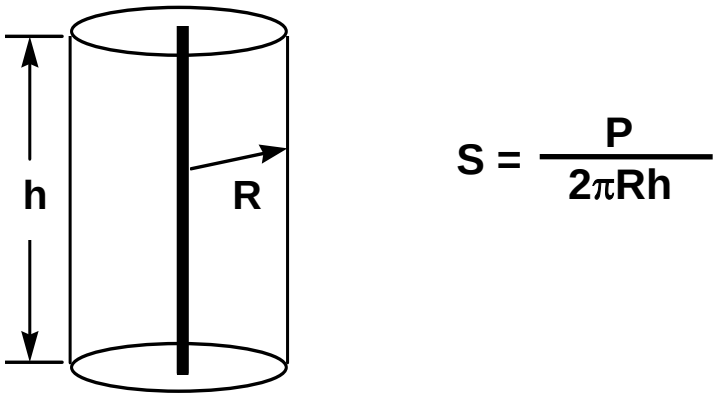

Figure 4. Distribution of power over surface of an imaginary cylinder surrounding an omnidirectional antenna. S is the spatially averaged power density.

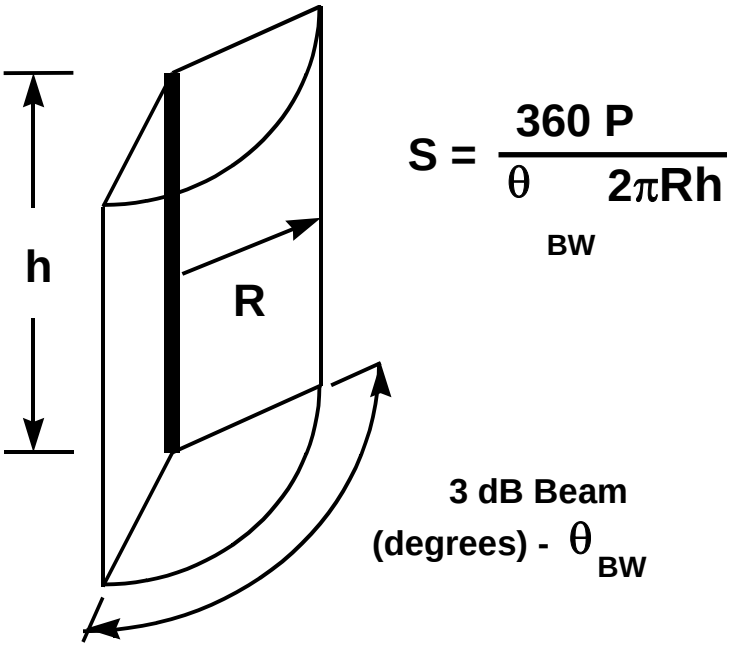

Figure 5. Modified cylindrical model for sector-type antennas assumes that all power is radiated through the reduced portion of a partial cylindrical surface. S is the spatially averaged power density.

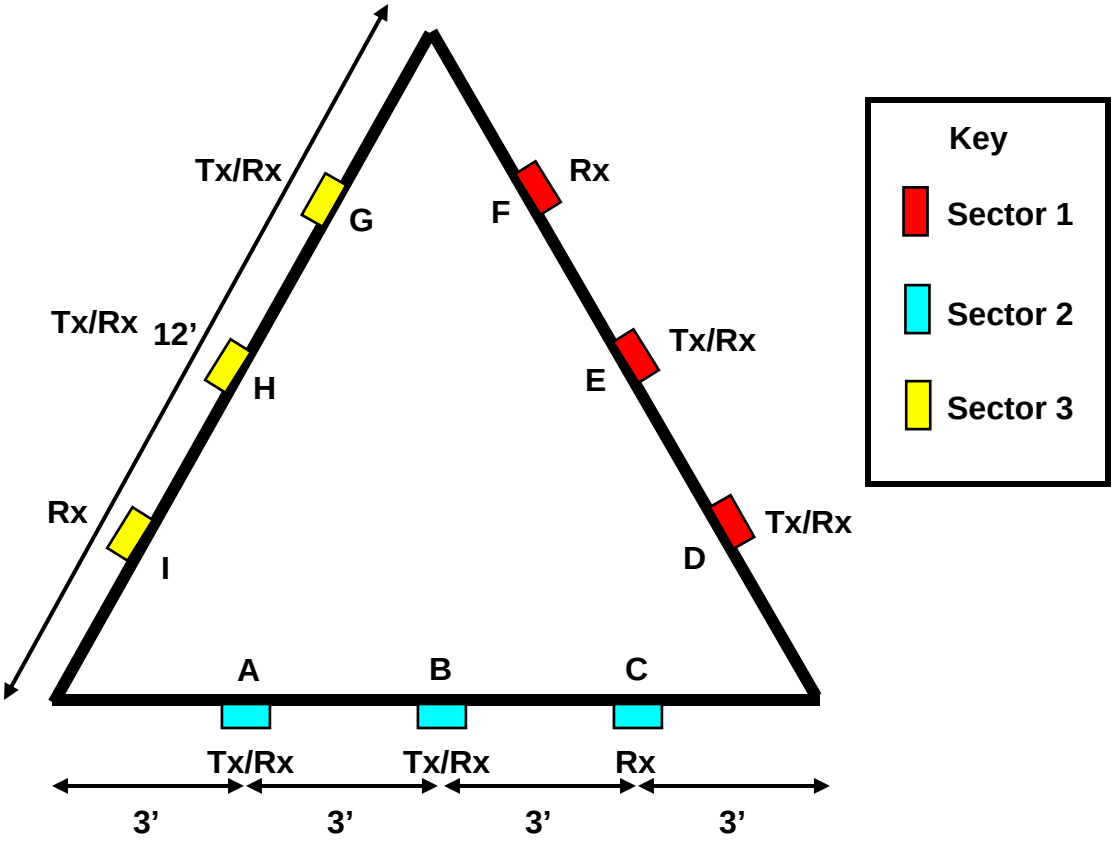

Figure 6. Geometrical arrangement of panel antennas at top of Bluegrass cellular tower.

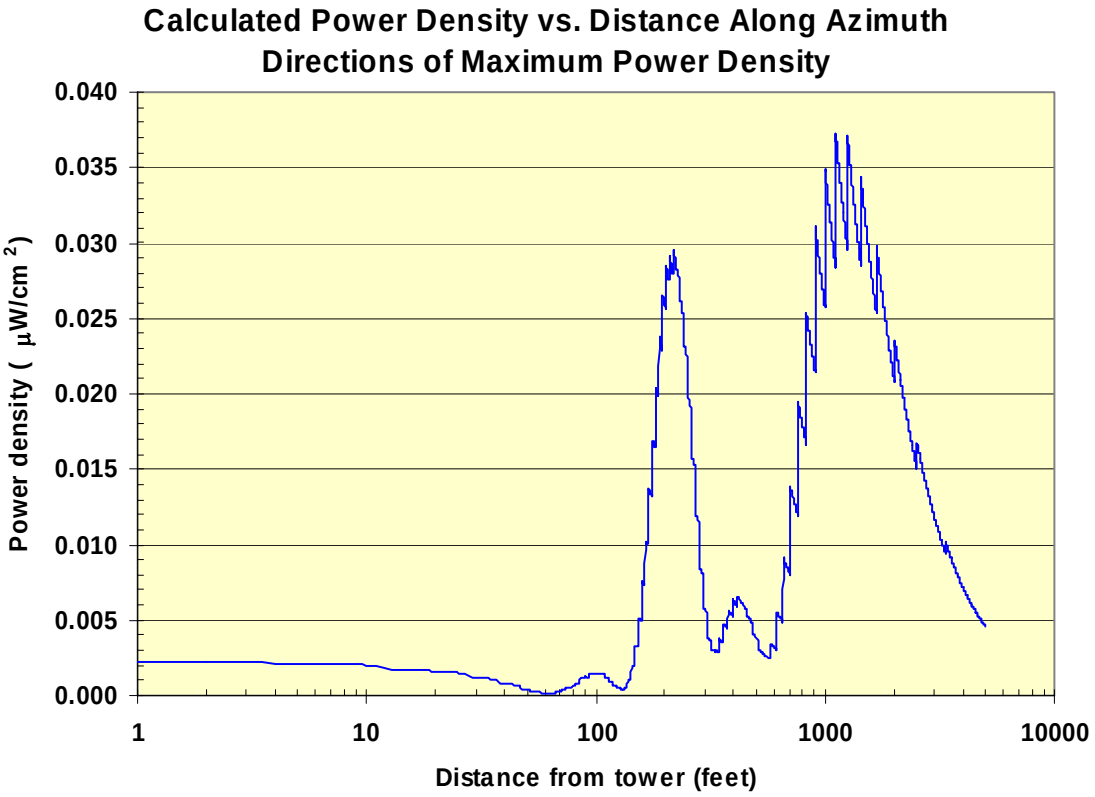

Figure 7. Calculated maximum ground level RF field power density as a function of distance from the proposed Blue Grass cellular telephone base station. The calculated power density is based on an assumption that a total of 20 watts will be delivered to transmitting antennas oriented in each of three sectors and that the RF fields associated with emissions from each of the six transmitting antennas will add together, taking into account azimuth directivity of each. The absolute maximum power density was found to be 0.0373 microwatts per square centimeter at approximately 1,100 feet from the tower.

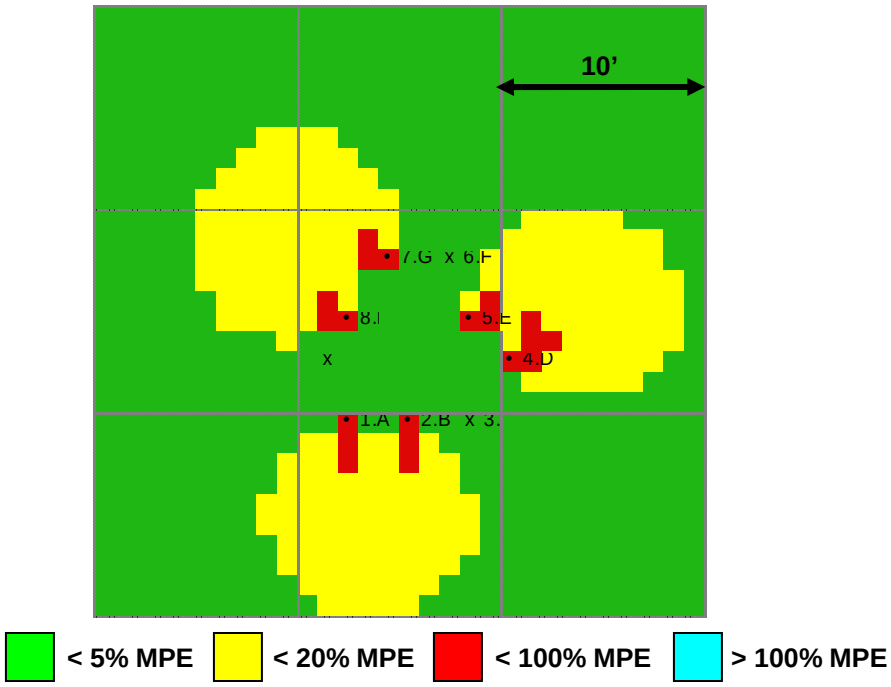

Figure 8. RoofView® analysis of RF fields with base of antennas at Z=0 feet relative to feet of standing worker. Fields expressed as percentage of controlled environment MPE limit.

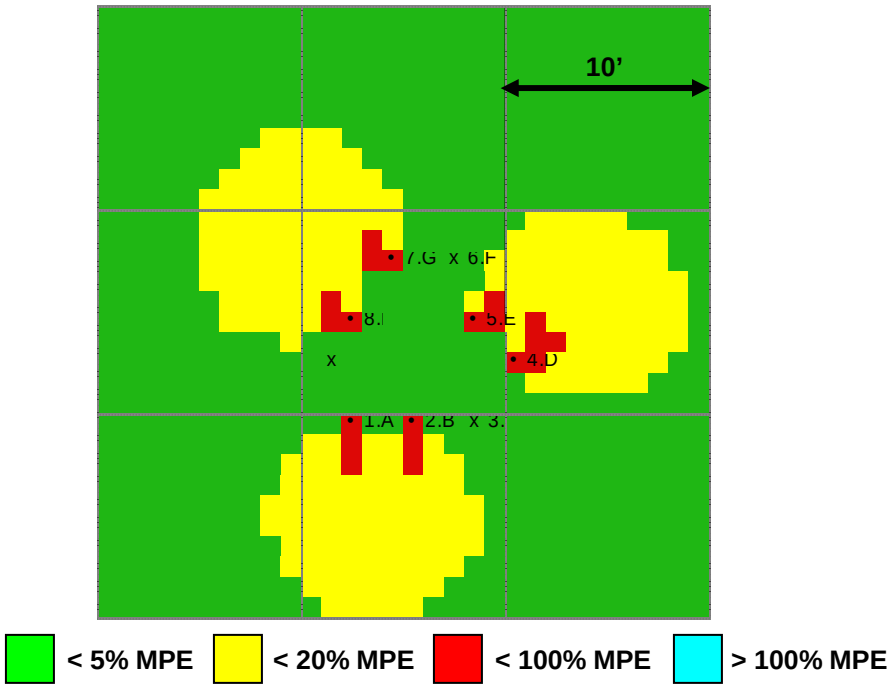

Figure 9. RoofView® analysis of RF fields with base of antennas at Z=1 feet relative to feet of standing worker. Fields expressed as percentage of controlled environment MPE limit.

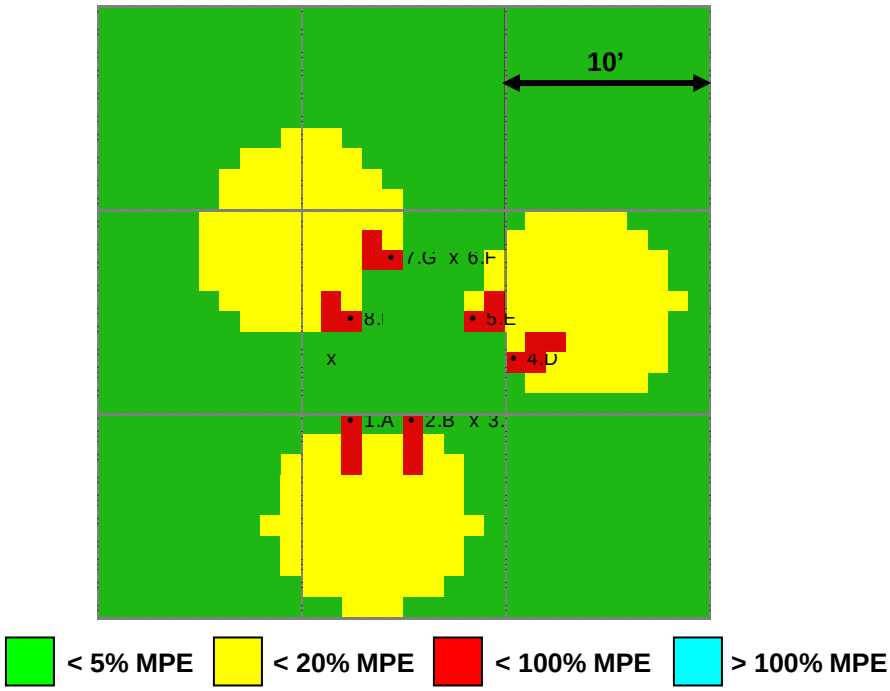

Figure 10. RoofView® analysis of RF fields with base of antennas at Z=2 feet relative to feet of standing worker. Fields expressed as percentage of controlled environment MPE limit.

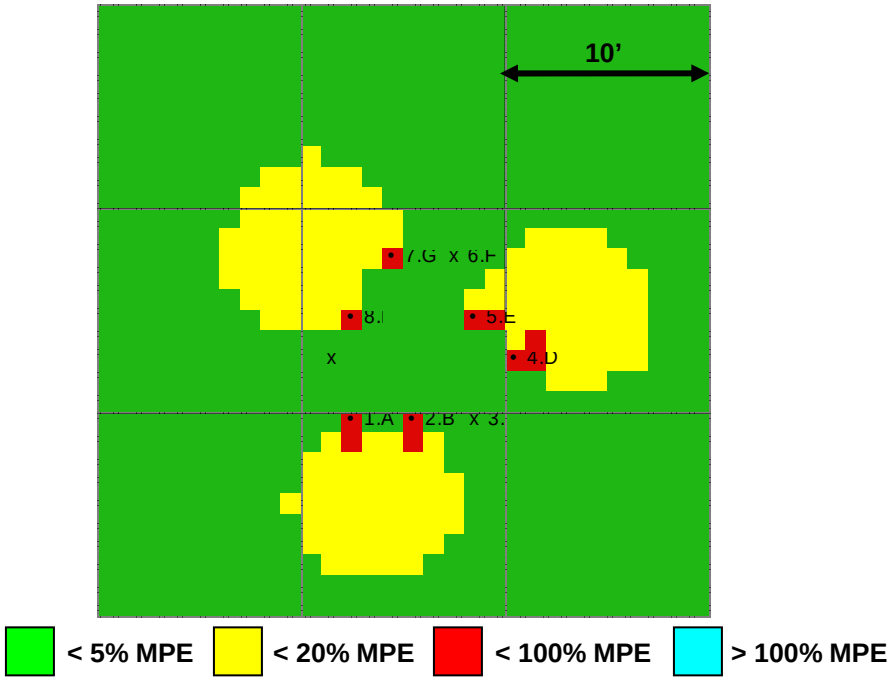

Figure 11. RoofView® analysis of RF fields with base of antennas at Z=3 feet relative to feet of standing worker. Fields expressed as percentage of controlled environment MPE limit.

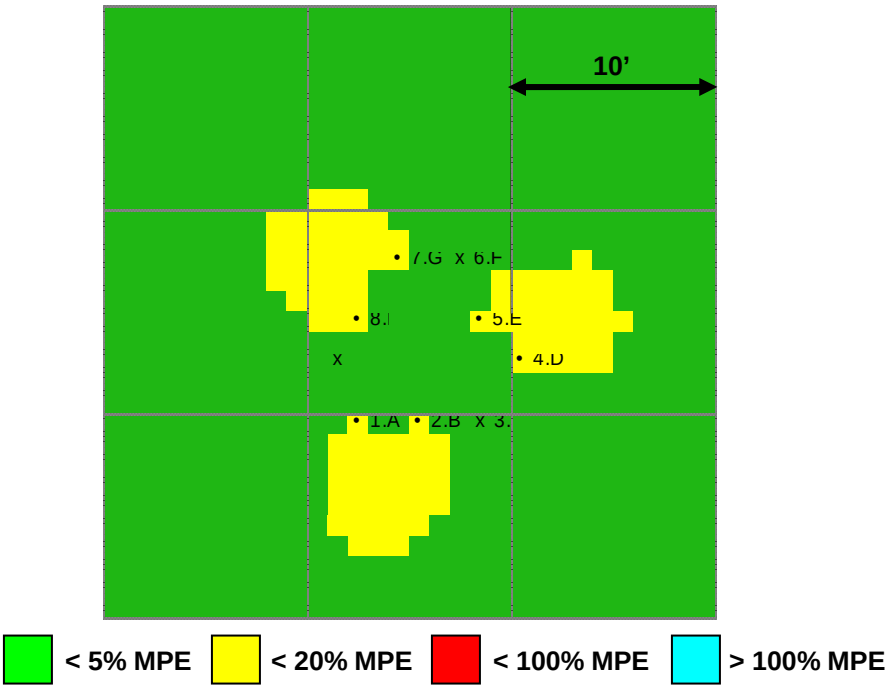

Figure 12. RoofView® analysis of RF fields with base of antennas at Z=4 feet relative to feet of standing worker. Fields expressed as percentage of controlled environment MPE limit.

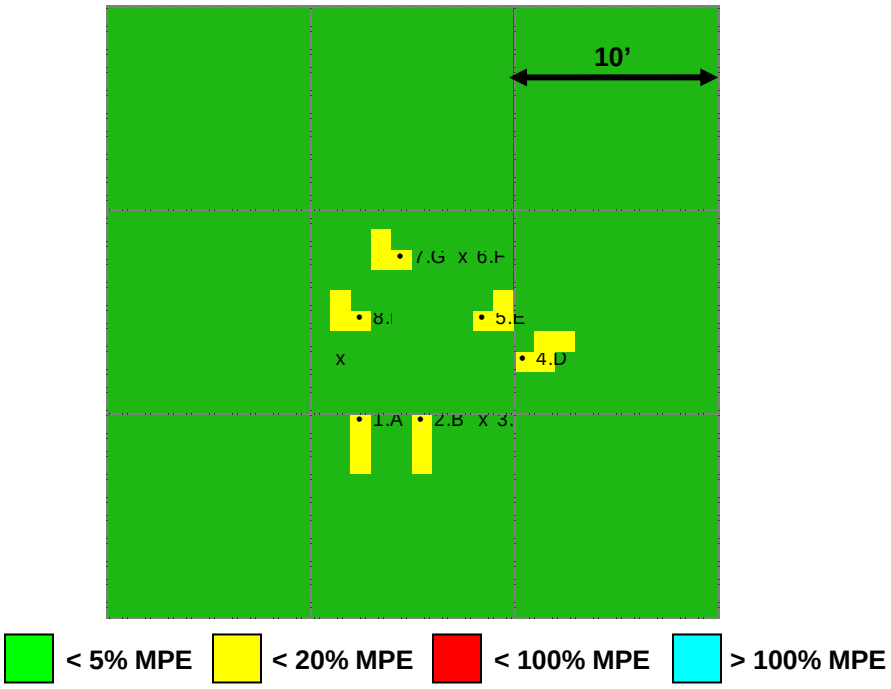

Figure 13. RoofView® analysis of RF fields with base of antennas at Z=5 feet relative to feet of standing worker. Fields expressed as percentage of controlled environment MPE limit.

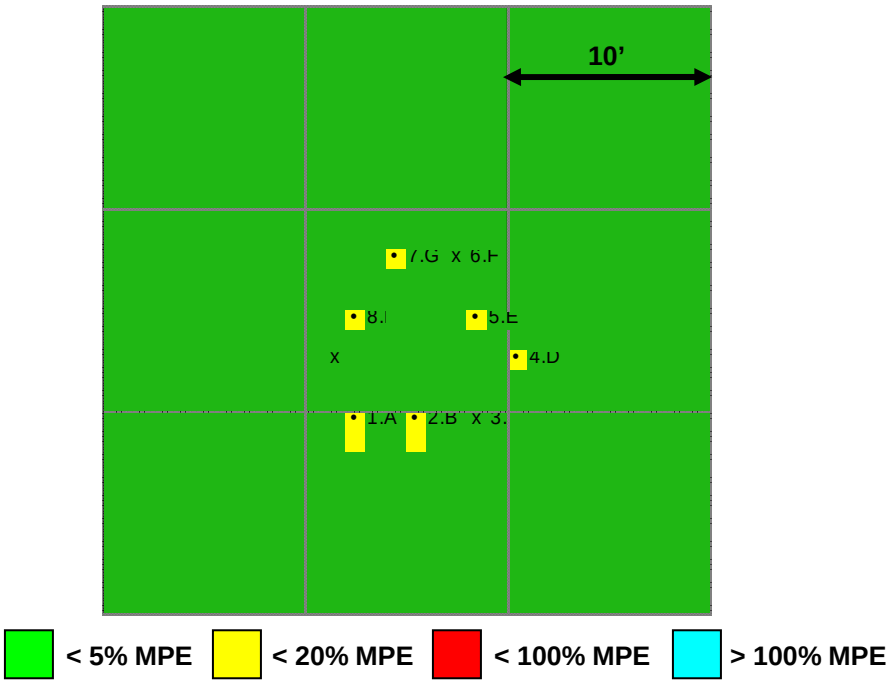

Figure 14. RoofView® analysis of RF fields with base of antennas at Z=6 feet relative to feet of standing worker. Fields expressed as percentage of controlled environment MPE limit.

Attachment 8: Agency Comments

Attachment 9: Public Comments – Additional comments received through February 7, 2005 will be included in the final document.

July 10, 2004

Mr. Ronald R. Switzer, Superintendent
Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, KY 42259-0007

RE: Comments on draft "Environmental Assessment to Construct Wireless Telecommunication Facilities at Hickory Cabin Fire Tower Site"

Dear Superintendent Switzer:

What follows are the comments of Karst Environmental Education and Protection, Inc. ("KEEP") on the above-referenced draft document. Your transmittal letter to us indicated that comments would be accepted through July 15th. For the reasons identified below, KEEP submits that the draft Environmental Assessment ("EA") is inadequate under the National Environmental Policy Act ("NEPA") and National Historic Preservation Act ("NHPA").

KEEP is an incorporated entity whose mission is to educate and advocate towards the goal of protecting, conserving, and defending karst, karst systems, and karst landscapes. In addition to using the subsurface resources of Mammoth Cave National Park and the surrounding area, KEEP members actively use the surface resources at the Park, including the trail system.

Description of the Proposed Action

The description of the proposed action is found at p. 2 of the draft EA. Two items are noted:

- The text at p. 2 indicates the height of the proposed tower at 180 ft. However, the site plan at p. 8 identifies a "proposed 240'-0" self support tower." Please clarify the exact height of the tower.
- The description indicates that National Park Service ("NPS") radio facilities and equipment of other wireless telecommunication providers would be co-located with the proposed cell tower. These ancillary facilities are discussed below.

Purpose and Need Statement

The purpose and need statement in the draft EA for the proposed cell tower at the Hickory Cabin site states that the tower is "to provide improved telecommunications to enhance the ***health and safety*** of park visitors, employees, and those people residing or traveling in the area immediately north of the park," (emphasis added; draft EA, p. 1). The purpose and need statement further notes that the "affected population" is nearly 2

million annually, including park visitors and other recreational travelers in the region, nearby residents, and non-recreational visitors and traffic in the park and surrounding area (Id.).

The stated "problem" to be solved by the proposal is risks to **health and safety** caused by the absence of individual cell phone service not only within the Park, but for those living or traveling north of the Park. The "need" portion of the statement, however, completely fails to quantify or factually support the "problem" statement and, therefore, falls short under NEPA. How many incidents within the Park (recreational or non-recreational visitors who are "lost or injured," as mentioned on p. 1) have annually occurred for which access to cellular service would have enhanced emergency or medical response? The draft EA states (p. 23) that "Public safety is affected by the lack of telephone service in most of the park." This statement is a *non sequiter* in the context of purpose and need in that it does not provide any data on how safety is affected. Further, of the 2 million annual "affected population," how many are actually Park visitors vs. estimated regional travelers? The latter is important to quantify for the purpose of analyzing alternatives to the proposed action, particularly the no-action alternative (discussed below). Without quantitative justification, one could just as readily conclude that the purpose and need is for the *convenience* of the public, both off and on site of the Park.

Alternatives Analysis

The no-action alternative—construction of the proposed cell tower outside the boundary of the Park—is incompletely analyzed. NEPA requires that federal agencies explore reasonable alternatives that satisfy the "purpose and need" statement, even if the alternative is outside the jurisdiction of the agency. The draft EA, while acknowledging that private telecommunications providers could construct such off-site facilities, cursorily dismisses the no-action alternative by stating that construction of an off-site tower would not provide adequate service within the primary visitor use areas of the Park and would not offer the chance to co-locate NPS radio system equipment. **However, no data are presented that indicate that the lack of access to cell phone usage by visitors within the "primary visitor use areas" of the Park currently present a "health and safety" problem that would be solved by an on-site facility.** Additionally, no justification was presented as to why NPS radio system equipment could not be co-located at an off-site facility

Since the purpose and need statement specifically identifies the unquantified "health and safety" needs of off-site residents and travelers, particularly north of the Park, as "justifying" the proposed action, more analysis needs to be conducted on off-site locations before the no-action alternative is summarily dismissed, as it is in the current draft EA.

For instance, the proposed Hickory Cabin tower site appears to be at 860' MSL. If the tower were located near the intersection of SR 1827 and the Ferry Road, just north of the Park on the ridge top, the elevation would be 878' MSL, an advantage of 18 feet. This location would seem to afford better reception for Nolin Lake users, without affecting the

coverage footprint within the park. Almost any location along the ridge to the north might offer a similar advantage. A location off the Park to the north would likely be closer to existing electric power. Antenna co-location agreements between government agencies and commercial telecommunications providers are routinely negotiated, as are rack provisions for radio repeater equipment. Is it not true that the present Park radio tower would be on a line of sight to any tower on top of the ridge? The observation that a tower located atop the ridge would be visible, while true, would seem to be nullified by the frequency of cell towers in today's urban and suburban landscapes. Furthermore, it may be that the Hickory Cabin tower would be visible from trails such as those near the former Good Spring Church and similar high points.

Impacts Analysis

One of the primary potential direct impacts of the proposed cell tower is to the viewshed of the Park and off-site properties. The viewshed impacts analysis for the no-action and two on-site alternatives is completely qualitative. The draft EA must include a side view, to scale and to elevation, of viewshed impacts (or not) to the cell tower from key public vantage points, including roads, during all seasons for the on-site and reasonably presumable off-site facilities. The Section 106 process also requires this quantification and depiction to guide the identification and effects determination process for listed and potentially eligible National Register properties, including cultural landscapes.

NEPA requires that both adverse and beneficial impacts be identified and analyzed. No discussion is provided on possible benefits to the NPS from location of its own radio facilities on the tower, nor monetary consideration provided the NPS by the private telecommunications service provider. NEPA's "full disclosure" mandate is not met until this information is provided in the EA.

Proposed Mitigation

The proposed mitigation measures at p. 40 fail to address mitigation of viewshed impacts. If the NPS proceeds with its preferred alternative, KEEP requests that the EA include a mitigation commitment as follows:

- All above-ground equipment (including the tower itself and the prefab building) be painted to blend in with surrounding natural vegetation and the background of the project area. No lights will be placed on any above-ground structure, including the tower (although this is mentioned on p. 2 of the draft EA, this measure is not identified in the mitigation commitments).

In addition, KEEP requests the following as mitigation measures, should the NPS proceed with its preferred alternative:

- The terms and conditions of any NPS right of way permit issued to the private telecommunications provider be incorporated into the NEPA and NHPA documentation as mitigation measures, particularly the provider's responsibility

to incur all costs of construction, installation, and maintenance (including painting).
- The right of way permit prohibit expansions or alterations to the design presented in the NEPA documentation without prior notice to, and input from, the public and some level of NEPA and NHPA review.

Conclusion

In closing, KEEP submits that the draft EA is insufficient for the following reasons:

- The purpose and need statement is not factually and numerically justified;
- The no-action alternative is dismissed without analysis;
- The impacts analysis for viewshed impacts is not technically presented or supported in the draft EA and possible beneficial impacts to the Park are not presented; and
- The proposed mitigation measures for the NPS's preferred alternative are incomplete.

Please ensure that these comments are included in the administrative record for the proposed action and include us in the mailing list for subsequent actions on the proposal. We look forward to receiving your written response to our comments.

Sincerely,

Karst Environmental Education and Protection, Inc. Board of Directors

Dr. Thomas C. Barr
1520 Chickering Road
Nashville, TN 37215-4904

Leslie E. Barras
100 N. Keats Ave.
Louisville, KY 40206

John Blubaugh
201 Church St.
Oakland, KY 42159

Roger W. Brucker
1635 Grange Hall Rd.
Beavercreek, OH 45432

Dr Hilary Lambert
720B Aurora Ave.
Lexington, KY 40502

Dr. Thomas L. Poulson
318 Marberry Circle
Jupiter, FL 33458

Rec'd 10-14-04

October 6, 2004

Vicki Carson
Mammoth Cave National Park
P O Box 7
Mammoth Cave, KY 42259

RE: Bluegrass Cell Phone Tower

Dear Ms. Carson,

I feel that we need this tower and the advantage of having this is much greater than the disadvantage. I hope the park is successful in getting the tower erected.

Thank You,

Barbara Priddy

Barbara Priddy
204 Horse Branch Road
Cub Run, KY 42729

270-524-4519
270-528-7683

Oct 5, 2004

Ms Carson –

Placing a cell tower in Mammoth Cave Natl Park is a very bad idea and I hope it doesn't happen! As I write this I know I'm wasting my time and a postage stamp, because it's a done deal.

The Courier Journal must not have found out about this until the official comment period had ended. I've heard nothing in any of the area media about this scheme.

We face cell phones at every turn, in restaurants, theaters, etc. We face danger on the roads from vehicles rushing toward us with drivers that have a cell phone stuck to their ear.

I hike the trails at Mammoth Cave and I have a cell phone that I leave in my car. I come here to enjoy the peace, quiet and beauty of the park, not to listen to some loudmouth on a cell phone.

The safety issue doesn't hold water, either because we never hear of any dramatic rescues that would have been made easier if a cell phone and tower were involved. I don't want this tower placed in our beautiful park!

William Sprouse

Scott Mello
2856 Nolin Dam Rd.
Mammoth Cave, Kentucky 42259
Telephone (270) 286-4126

Sept. 19, 2004

Dear Mr. Switzer
Supt. of Mammoth Cave National Park,

I wished to express my support for the efforts to place a cellular tower inside Mammoth Cave National Park.

I have a business on Hwy. 728 near Nolin Lake and at the rear of Mammoth Cave National Park. I sell cellular service for Bluegrass Cellular and I recieve many complaints because of poor reception in the Nolin Lake, Lincoln, Cub Run and Mammoth Cave areas.

It is an inconvenience to locals and tourists alike. Many tourists who are from urban areas rely on their cellular phones and do not realize that they will not have reception in such isolated areas. I could easily see how this service will improve safety for so many visiting Mammoth Cave National Park and Nolin Lake State Park.

I truly feel that this new tower will help many and I commend you and your staff for working toward resolving this problem.

Sincerely,

Scott D. Mello

Anthony C. Mello
2884 Nolin Dam Rd.
Mammoth Cave, KY 42259

Mr. Ron Switzer
Superintendent of Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, KY 42259

Sept. 22, 2004

Dear Mr. Switzer,

I wanted to send a letter of support for a cellular tower in Mammoth Cave National Park. I have been in business and sales all of my life and my cellular phone is a vital part of my business.

Living in the area, and working in Bowling Green, Kentucky, about 30 minutes of my drive time is without effective cellular service. A tower in Mammoth Cave National Park would change this and I would very much appreciate it.

Sincerely,

Tony Mello

Linda Clark
1012 Wilderness Rd.
Mammoth Cave, KY 42259

Mr. Ron Switzer
Supt. of Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, KY 42259

Sept. 21, 2004

Dear Mr. Switzer,

I am writing concerning the placement of a cellular telephone tower in Mammoth Cave National Park. I wished to express my support for this project.

I attend church most every Sunday in Cave City and travel from Nolin Lake across the Green River Ferry to do so. I often drive three other people who are older thank I am so that they may attend church. I know we would all find it of comfort to know, should we slid on ice, hit a deer, or simply have car trouble or a health concern that we would be able to utilize celluar service for assistance.

I also am the proud mother of a Kentucky State Policeman and do appreciate the ability for him to be able to contact me or should I need to contact him and this service would also provide helpful.

Thank You,

Linda Clark

Linda Clark

Mrs. Mattie Mello
2870 Nolin Dam Rd
Mammoth Cave, KY 42259
Telephone (270) 286-4644

Mr. Ron Switzer
Superintendent of Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, KY 42259

Sept. 22, 2004

Dear Mr. Switzer,

I am an 80 year young mother, grandmother and great-grandmother and the surviving widow of a World War II Veteran. I am blessed to still have the pleasure of driving my own automobile.

Many things in technology have came in existence in my lifetime one of which is cellular telephone service. I keep one in my vehicle for the purpose of emergencies. However there are some places near my home that do not have enough towers to provide reliable service. The Mammoth Cave area is one.

I will plan my routes on where I feel most secure. I am sure that others do also. I feel that it is a good thing to place a cellular telephone tower in the area and I thank you for your efforts.

Sincerely,

Mattie Mello

Mattie Mello

Rhonda Mello
2856 Nolin Dam Rd.
Mammoth Cave KY 42259

Mr. Ron Switzer
Supt. of Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, KY 42259

Sept. 21, 2004

Dear Mr. Switzer,

I wished to offer my personal feelings about the efforts to place a cellular telephone tower inside Mammoth Cave National Park. I think it is much needed.

I work at the Tourism Office in Brownsville, KY and receive many telephone calls from cellular users who are lost or needed local information on hotels, camping, cave tour ticket information, and etc. on the toll-free telephone line that we have established for this purpose.

Many times the reception is so poor that it is very difficult to assist the tourists. I believe this tower could only be a plus to the tourists.

I often travel the roads through the National Park to business meetings alone and would also find this to be an added comfort for my own personal safety.

Thank You,

Rhonda Mello

Rhonda Mello

The Museum of Modern Art
11 West 53 Street, New York, NY 10019
www.moma.org

As a partime resident of Nolin Lake (off 728), it would be very helpful to me if I could get better reception on my Cell Phone. Please consider the new tower as a positive thing..

E. Morrison
148 Saturn Cir
Radcliff Ky
40160

LOUISV
OCT 23 2004
USPS - 40231

Supt
Mammoth Cave Natl Park
P.O. Box 7
Mammoth Cave Ky
42259

A Clockwork Orange 1971. Directed by Stanley Kubrick. Warner Bros.

Rec'd 10/26/04

Rec'd 10/26/04

EDMONSON COUNTY
CHAMBER OF COMMERCE

P. O. BOX 342
BROWNSVILLE, KY 42210

October 20, 2004

Superintendent Ronald R. Switzer
Mammoth Cave National Park
P.O. Box 7
Mammoth Cave, Kentucky 42259

Superintendent Switzer:

With this letter I wish to convey to you the support of the Edmonson County Chamber of Commerce for your intentions to allow a tower to be constructed within the park to improve the usage of cellular telephones. At the most recent Board of Directors meeting, this topic was discussed; and the Board voted unanimously to support your efforts.

This tower will not only improve reception in the park but will also greatly enhance coverage over a large section of Edmonson County, especially the Lincoln area including parts of Nolin River Lake. The installation of this tower will improve the safety of all persons in these areas; and in addition, it will improve our efforts to promote commerce throughout Edmonson County.

Again, I want you to know we applaud your efforts and would like to offer our assistance in any way to expedite this much needed addition.

Sincerely,

Mark Rich

Mark Rich
President

COMMONWEALTH OF KENTUCKY
SHARON FRENCH, CLERK
EDMONSON CIRCUIT / DISTRICT COURTS
P.O. BOX 739
BROWNSVILLE, KENTUCKY 42210
FAX: (270) 597-2884

SUE MEREDITH
CHIEF DEPUTY

CIRCUIT COURT
(270) 597 2584
DISTRICT COURT
(270) 597-3918

December 1, 2004

Superintendent
Mammoth Cave National Park
P. O. Box 7
Mammoth Cave, Ky. 42259

Sir:

I have been informed Edmonson County Chamber of Commerce has voted to support the construction of a new cell phone tower within Mammoth Cave National Park.

We have been in need of a tower through this area for a very long time. Many of our citizens are employed in Barren County using the national park route. We have no phone signal in a large portion of the area, therefore should an emergency arise there would be no way to contact an emergency vehicle for help. This tower should definitely be constructed, not only for the citizens of my county but the surrounding counties. Also we have thousands of visitors from all over the United States each year traveling to Mammoth Cave National Park. These people should have phone service during their stay with us.

I am very much in support of this tower and am hopeful to see this under construction in the very near future.

Sincerely,

Sharon French
Circuit Court Clerk

N. E. Reed
Edmonson County Judge/Executive

Edmonson County
Courthouse

P.O. Box 363
Brownsville, KY 42210
(270) 597-2819

December 1, 2004

Superintendent Ronald R. Switzer
Mammoth Cave National Park
P. O. Box 7
Mammoth Cave, Kentucky 42259

Subject: Wireless Communications Tower

Dear Superintendent Switzer,

I recently read where Mammoth Cave National Park has approached Bluegrass Cellular about erecting a wireless telecommunications tower in the northern section of the park near the Stockholm Community.

As Edmonson County Judge/Executive, I regularly experience the cell phone reception problems in the area noted above. Erecting this tower will be very helpful to law enforcement, emergency personnel, and our school districts. Due to the northern section of the county being at a higher elevation, there is usually more snow and ice accumulation to contend with. To have better reception during these times will be a major safety factor for our buses and students.

You and your staff are to be commended for your efforts in pursuing this project. This is a project unanimously support by the Edmonson County Fiscal Court and myself.

Sincerely,

N.E. Reed
Edmonson County
Judge/Executive

EDUCATION PAYS

EDMONSON COUNTY
PROPERTY VALUATION ADMINISTRATOR

PO Box 37 Brownsville, Kentucky 42210-0037 (270) 597-2381

December 6, 2004

Mr. Ronald Switzer, Supeintendent
Mammoth Cave National Park
PO Box 7
Mammoth Cave , KY 42259

Mr. Switzer,

In regards to the possibility of the new cell tower located in the northern section of Mammoth Cave National Park.

I wanted to let you know that I am in support of this new cell tower. I was privileged to work three seasons at Mammoth Cave National Park and I am currently on the Executive Committee of the Mammoth Cave National Park Association and do have concern for our parks environment and safety as well.

I think the installation of a cell tower would greatly benefit visitors to the park, local residents and park service personnel for safety of all parties concerned.

The cell tower itself would have minimum to none negative environmental impact on the park, and get better cell coverage for the area to provide positive benefits as previously mentioned.

With best wishes, I am

Sincerely yours,

Benton A. Cowles
Edmonson County PVA